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THE PSYCHOLOGICAL REVIEW.

PSYCHOLOGY AND SOCIAL PRACTICE.¹

BY PROFESSOR JOHN DEWEY,
The University of Chicago.

In coming before you I had hoped to deal with the problem of the relation of psychology to the social sciences—and through them to social practice, to life itself. Naturally, in anticipation, I had conceived a systematic exposition of fundamental principles covering the whole ground, and giving every factor its due rating and position. That discussion is not ready to-day. I am loath, however, completely to withdraw from the subject, especially as there happens to be a certain phase of it with which I have been more or less practically occupied within the last few years. I have in mind the relation of Psychology to Education. Since education is primarily a social affair, and since educational science is first of all a social science, we have here a section of the whole field. In some respects there may be an advantage in approaching the more comprehensive question through the medium of one of its special cases. The absence of elaborated and coherent view may be made up for by a background of experience, which shall check the projective power of reflective abstraction, and secure a translation of large words and ideas into specific images. This special territory, moreover, may be such as to afford both sign-posts and broad avenues to the larger sphere—the place of psychology among the social sciences. Because I anticipate such an outcome, and because I shall make a survey of the broad field from the special

¹ Address of the President before the American Psychological Association, New Haven, 1899.

standpoint taken, I make no apology for presenting this discussion to an Association of Psychologists rather than to a gathering of educators.

In dealing with this particular question, it is impossible not to have in mind the brilliant and effective discourses recently published by my predecessor in this chair. I shall accordingly make free to refer to points, and at times to words, in his treatment of the matter. Yet, as perhaps I hardly need say, it is a problem of the most fundamental importance for both psychology and social theory that I wish to discuss, not any particular book or article. Indeed with much of what Dr. Münsterberg says about the uselessness and the danger for the teacher of miscellaneous scraps of child study, of unorganized information regarding the nervous system, and of crude and uninterpreted results of laboratory experiment, I am in full agreement. It is doubtless necessary to protest against a hasty and violent bolting of psychological facts and principles which, of necessity, destroys their scientific form. It is necessary to point out the need of a preliminary working over of psychological material adapting it to the needs of education. But these are minor points. The main point is whether the standpoint of psychological science, as a study of mechanism, is indifferent and opposed to the demands of education with its free interplay of personalities in their vital attitudes and aims.

I.

The school practice of to-day has a definite psychological basis. Teachers are already possessed by specific psychological assumptions which control their theory and their practice. The greatest obstacle to the introduction of certain educational reforms is precisely the permeating persistence of the underlying psychological creed. Traced back to its psychological ultimates, there are two controlling bases of existing methods of instruction. One is the assumption of a fundamental distinction between child psychology and the adult psychology where, in reality, identity, reigns; viz.: in the region of the motives and conditions which make for mental power. The other is the assumption of likeness where marked difference is the feature

most significant for educational purposes ; I mean the specialization of aims and habits in the adult, compared with the absence of specialization in the child, and the connection of undifferentiated status with the full and free growth of the child.

The adult is primarily a person with a certain calling and position in life. These devolve upon him certain specific responsibilities which he has to meet, and call into play certain formed habits. The child is primarily one whose calling is growth. He is concerned with arriving at specific ends and purposes—instead of having a general framework already developed. He is engaged in forming habits rather than in definitely utilizing those already formed. Consequently he is absorbed in getting that all around contact with persons and things, that range of acquaintance with the physical and ideal factors of life, which shall afford the background and material for the specialized aims and pursuits of later life. He is, or should be, busy in the formation of a flexible variety of habits whose sole immediate criterion is their relation to full growth, rather than in acquiring certain skills whose value is measured by their reference to specialized technical accomplishments. This is the radical psychological and biological distinction, I take it, between the child and the adult. It is because of this distinction that children are neither physiologically nor mentally describable as 'little men and women.'

The full recognition of this distinction means of course the selection and arrangement of all school materials and methods for the facilitation of full normal growth, trusting to the result in growth to provide the instrumentalities of later specialized adaptation. If education means the period of prolonged infancy, it means nothing less than this. But look at our school system and ask whether the 3 R's are taught, either as to subject matter or as to method, with reference to growth, to its present demands and opportunities ; or as technical acquisitions which are to be needed in the specialized life of the adult. Ask the same questions about geography, grammar and history. The gap between psychological theory and the existing school practice becomes painfully apparent. We readily realize the extent to which the present school system is dominated by carrying over

into child life a standpoint and method which are significant in the psychology of the adult.

The narrow scope of the traditional elementary curriculum, the premature and excessive use of logical analytic methods, the assumption of ready-made faculties of observation, memory, attention, etc., which can be brought into play if only the child chooses to do so, the ideal of formal discipline—all these find a large measure of their explanation in neglect of just this psychological distinction between the child and the adult. The hold of these affairs upon the school is so fixed that it is impossible to shake it in any fundamental way, excepting by a thorough appreciation of the actual psychology of the case. This appreciation cannot be confined to the educational leaders and theorists. No individual instructor can be sincere and whole-hearted, to say nothing of intelligent, in carrying into effect the needed reforms, save as he genuinely understands the scientific basis and necessity of the change.

But in another direction there is the assumption of a fundamental difference: Namely, as to the conditions which secure intellectual and moral progress and power.¹ No one seriously questions that, with an adult, power and control are obtained through realization of personal ends and problems, through personal selection of means and materials which are relevant, and through personal adaptation and application of what is thus selected, together with whatever of experimentation and of testing is involved in this effort. Practically every one of these three conditions of increase in power for the adult is denied for the child. For him problems and aims are determined by another mind. For him the material that is relevant and irrelevant is selected in advance by another mind. And, upon the whole, there is such an attempt to teach him a ready-made method for applying his material to the solution of his problems, or the reaching of his ends, that the factor of experimentation is reduced to the minimum. With the adult we unquestioningly assume that an attitude of personal inquiry, based upon the possession of a problem which interests and absorbs, is a necessary

¹I owe this point specifically (as well as others more generally) to my friend and colleague, Mrs. Ella Flagg Young.

precondition of mental growth. With the child we assume that the precondition is rather the willing disposition which makes him ready to submit to any problem and material presented from without. Alertness is our ideal in one case; docility in the other. With one, we assume that power of attention develops in dealing with problems which make a personal appeal, and through personal responsibility for determining what is relevant. With the other we provide next to no opportunities for the evolution of problems out of immediate experience, and allow next to no free mental play for selecting, assorting and adapting the experiences and ideas that make for their solution. How profound a revolution in the position and service of textbook and teacher, and in methods of instruction depending therefrom, would be effected by a sincere recognition of the psychological identity of child and adult in these respects can with difficulty be realized.

Here again it is not enough that the educational commanders should be aware of the correct educational psychology. The rank and file, just because they are persons dealing with persons, must have a sufficient grounding in the psychology of the matter to realize the necessity and the significance of what they are doing. Any reform instituted without such conviction on the part of those who have to carry it into effect, would never be undertaken in good faith, nor in the spirit which its ideal inevitably demands; consequently it could lead only to disaster.

At this point, however, the issue defines itself somewhat more narrowly. It may be true, it is true, we are told, that some should take hold of psychological methods and conclusions, and organize them with reference to the assistance which they may give to the cause of education. But this is not the work of the teacher. It belongs to the general educational theorist: the middleman between the psychologist and the educational practitioner. He should put the matter into such shape that the teacher may take the net results in the form of advice and rules for action; but the teacher who comes in contact with the living personalities must not assume the psychological attitude. If he does he reduces persons to objects, and thereby distorts, or

rather destroys, the ethical relationship which is the vital nerve of instruction (*Psychology and Life*, p. 122, and pp. 136-138).

That there is some legitimate division of labor between the general educational theorist and the actual instructor, there is of course no doubt. As a rule, it will not be the one actively employed in instruction who will be most conscious of the psychological basis and equivalents of the educational work, nor most occupied in finding the pedagogical rendering of psychological facts and principles. Of necessity, the stress of interest will be elsewhere. But we have already found reason for questioning the possibility of making the somewhat different direction of interest into a rigid dualism of a legislative class on one side and an obedient subject class on the other. Can the teacher ever receive 'obligatory prescriptions'? Can he receive from another a statement of the means by which he is to reach his ends, and not become hopelessly servile in his attitude? Would not such a result be even worse than the existing mixture of empiricism and inspiration?—just because it would forever fossilize the empirical element and dispel the inspiration which now quickens routine. Can a passive, receptive attitude on the part of the instructor (suggesting the soldier awaiting orders from a commanding general) be avoided, unless the teacher, as a student of psychology, himself sees the reasons and import of the suggestions and rules that are proffered him?

I quote a passage that seems of significance: "Do we not lay a special linking science everywhere else between the theory and practical work? We have engineering between physics and the practical workingmen in the mills; we have a scientific medicine between the natural science and the physician" (p. 138). The sentences suggest, in an almost startling way, that the real essence of the problem is found in an *organic* connection between the two extreme terms—between the theorist and the practical worker—through the medium of the linking science. The decisive matter is the extent to which the ideas of the theorist actually project themselves, through the kind offices of the middleman, into the consciousness of the practitioner. It is the participation by the practical man in the theory, through the agency of the linking science, that determines at

once the effectiveness of the work done, and the moral freedom and personal development of the one engaged in it. It is because the physician no longer follows rules, which, however rational in themselves, are yet arbitrary to him (because grounded in principles that he does not understand), that his work is becoming liberal, attaining the dignity of a profession, instead of remaining a mixture of empiricism and quackery. It is because, alas, engineering makes only a formal and not a real connection between physics and the practical workingmen in the mills that our industrial problem is an ethical problem of the most serious kind. The question of the amount of wages the laborer receives, of the purchasing value of this wage, of the hours and conditions of labor, are, after all, secondary. The problem primarily roots in the fact that the mediating science does not connect with his consciousness, but merely with his outward actions. He does not appreciate the significance and bearing of what he does; and he does not perform his work because of sharing in a larger scientific and social consciousness. If he did, he would be free. All other proper accompaniments of wage, and hours, healthful and inspiring conditions would be added unto him, because he would have entered into the ethical kingdom. Shall we seek analogy with the teacher's calling in the workingmen in the mill, or in the scientific physician?

It is quite likely that I shall be reminded that I am overlooking an essential difference. The physician, it will be said, is dealing with a body which either is in itself a pure object, a causal interplay of anatomical elements, or is something which lends itself naturally and without essential loss to treatment from this point of view; while the case is quite different in the material with which the teacher deals. Here is personality, which is destroyed when regarded as an object. But the gap is not so pronounced nor so serious as this objection implies. The physician after all is not dealing with a lifeless body; with a simple anatomical structure, or interplay of mechanical elements. Life functions, active operations, are the reality which confronts him. We do not have to go back many centuries in the history of medicine to find a time when the physician attempted to deal with these functions directly and immediately. They were so

overpoweringly present, they forced themselves upon him so obviously and so constantly that he had no resource save a mixture of magic and empiricism: magic so far as he followed methods derived from uncritical analogy, or from purely general speculation on the universe and life; empiricism so long as he just followed procedures which had been found helpful before in cases which somewhat resembled the present. We have only to trace the intervening history of medicine to appreciate that it is precisely the ability to state function in terms of structure, to reduce life in its active operations to terms of a causal mechanism, which has taken the medical calling out of this dependence upon a vibration between superstition and routine. Progress has come by taking what is really an activity as if it were only an object. It is the capacity to effect this transformation of life activity which measures both the scientific character of the physician's procedure and his practical control, the certainty and efficacy of what he, as a living man, does in relation to some other living man.

It is an old story, however, that we must not content ourselves with analogies. We must find some specific reason in the principles of the teacher's own activities for believing that psychology—the ability to transform a living personality into an objective mechanism for the time being—is not merely an incidental help, but an organic necessity. Upon the whole, the best efforts of teachers at present are partly paralyzed, partly distorted, and partly rendered futile precisely from the fact that they are in such immediate contact with sheer, unanalyzed personality. The relation is such a purely ethical and personal one that the teacher cannot get enough outside the situation to handle it intelligently and effectively. He is in precisely the condition in which the physician was when he had no recourse save to deal with health as entity or force on one side, and disease as opposing agency or invading influence upon the other. The teacher reacts *en bloc*, in a gross wholesale way, to something which he takes in an equally undefined and total way in the child. It is the inability to regard, upon occasion, both himself and the child as just objects working upon each other in specific ways that compels him to resort to purely arbitrary

measures, to fall back upon mere routine traditions of school teaching, or to fly to the latest fad of pedagogical theorists—the latest panacea peddled out in school journals or teachers' institutes—just as the old physician relied upon his magic formula.

I repeat, it is the fundamental weakness of our teaching force to-day (putting aside teachers who are actually incompetent by reason either of wrong motives or inadequate preparation), that they react in gross to the child's exhibitions in gross without analyzing them into their detailed and constituent elements. If the child is angry, he is dealt with simply as an angry being; anger is an entity, a force, not a symptom. If a child is inattentive, this again is treated as a mere case of refusal to use the faculty or function of attention, of sheer unwillingness to act. Teachers tell you that a child is careless or inattentive in the same final way in which they would tell you that a piece of paper is white. It is just a fact, and that is all there is of it. Now it is only through some recognition of attention as a mechanism, some awareness of the interplay of sensations, images and motor impulses which constitute it as an objective fact that the teacher can deal effectively with attention as a function. And, of course, the same is true of memory, quick and useful observation, good judgment and all the other practical powers the teacher is attempting to cultivate.

Consideration of the abstract concepts of mechanism and personality is important. Too much preoccupation with them in a general fashion, however, without translation into relevant imagery of actual conditions is likely to give rise to unreal difficulties. The ethical personality does not go to school naked; it takes with it the body as the instrument through which all influences reach it, and through control of which its ideas are both elaborated and expressed. The teacher does not deal with personality at large, but as expressed in intellectual and practical impulses and habits. The ethical personality is not formed—it is forming. The teacher must provide stimuli leading to the equipment of personality with active habits and interests. When we consider the problem of forming habits and interests we find ourselves at once confronted with matters of this sort: What stimuli shall be presented to the sense organs

and how? What stable complexes of associations shall be organized? What motor impulses shall be evoked, and to what extent? How shall they be induced in such a way as to bring favorable stimuli under greater control, and to lessen the danger of excitation from undesirable stimuli? In a word, the teacher is dealing with the psychical factors that are concerned with furtherance of certain habits, and the inhibition of others—habits intellectual, habits emotional, habits in overt action.

Moreover, all the instruments and materials with which the teacher deals must be considered as psychical stimuli. Such consideration involves of necessity a knowledge of their reciprocal reactions—of what goes by the name of causal mechanism. The introduction of certain changes into a net-work of associations, the reinforcement of certain sensori-motor connections, the weakening or displacing of others—this is the psychological rendering of the greater part of the teacher's actual business. It is not that one teacher employs mechanical considerations, and that the other does not, appealing to higher ends; it is that one does not know his mechanism, and consequently acts servilely, superstitiously and blindly, while the other, knowing what he is about, acts freely, clearly and effectively.¹

The same thing is true on the side of materials of instruction—the school studies. No amount of exaltation of teleological personality (however true, and however necessary the emphasis) can disguise from us the fact that instruction is an affair of bringing a child into intimate relations with concrete objects, positive facts, definite ideas and specific symbols. The symbols are objective things in arithmetic, reading and writing. The ideas are truths of history and of science. The facts are derived from such specific disciplines as geography and language, botany and astronomy. To suppose that by some influence of pure personality upon pure personality, conjoined with a knowledge of rules formulated by an educational theorist, an effective interplay of this body of physical and ideal objects with the life of the child can be effective, is, I submit, nothing but an appeal

¹ That some teachers get their psychology by instinct more effectively than others by any amount of reflective study may be unreservedly stated. It is not a question of manufacturing teachers, but of reinforcing and enlightening those who have a right to teach.

to magic, plus dependence upon servile routine. Symbols in reading and writing and number, are both in themselves, and in the way in which they stand for ideas, elements in a mechanism which has to be rendered operative within the child. To bring about this influence in the most helpful and economical way, in the most fruitful and liberating way, is absolutely impossible save as the teacher has some power to transmute symbols and contents into their working psychical equivalents: and save as he also has the power to see what it is in the child, as a psychical mechanism, that affords maximum leverage.

Probably I shall now hear that at present the danger is not of dealing with acts and persons in a gross, arbitrary way, but (so far as what is called new education is concerned) in treating the children too much as mechanism, and consequently seeking for all kinds of stimuli to stir and attract—that, in a word, the tendency to reduce instruction to a merely agreeable thing, weakening the child's personality and indulging his mere love of excitement and pleasure, is precisely the result of taking the psycho-mechanical point of view. I welcome the objection for it serves to clear up the precise point. It is through a partial and defective psychology that the teacher, in his reaction from dead routine and arbitrary moral and intellectual discipline, has substituted an appeal to the satisfaction of momentary impulse. It is not because the teacher has a knowledge of the psycho-physical mechanism, but because he has a partial knowledge of it. He has come to consciousness of certain sensations, and certain impulses, and of the ways in which these may be stimulated and directed, but he is in ignorance of the larger mechanism (just as a mechanism), and of the causal relations which subsist between the unknown part and the elements upon which he is playing. What is needed to correct his errors is not to inform him that he gets only misleading from taking the psychical point of view; but to reveal to him the scope and intricate interactions of the mechanism as a whole. Then he will realize that while he is gaining apparent efficacy in some superficial part of the mechanism, he is disarranging, dislocating and disintegrating much more fundamental factors in it. In a word he is operating not as a psychologist, but as a poor psychologist,

and the only cure for a partial psychology is a fuller one. He is gaining the momentary attention of the child through an appeal to pleasant color, or exciting tone, or agreeable association, but at the expense of isolating one cog and ratchet in the machinery, and making it operate independently of the rest. In theory, it is as possible to demonstrate this to a teacher, showing how the faulty method reacts unhappily into the personality, as it is to locate the points of wrong construction, and of ineffective transfer of energy in a physical apparatus.

This suggests the admission made by writers in many respects as far apart as Dr. Harris and Dr. Münsterberg—that scientific psychology is of use on the pathological side—where questions of ‘physical and mental health’ are concerned. But is there anything with which the teacher has concern that is not included in the ideal of physical and mental health? Does health define to us anything less than the teacher’s whole end and aim? Where does pathology leave off in the scale and series of vicious aims and defective means? I see no line between the more obvious methods and materials which result in nervous irritation and fatigue; in weakening the power of vision, in establishing spinal curvatures; and others which, in more remote and subtle, but equally real ways, leave the child with, say, a muscular system which is only partially at the service of his ideas, with blocked and inert brain paths between eye and ear, and with a partial and disconnected development of the cerebral paths of visual imagery. What error in instruction is there which could not, with proper psychological theory, be stated in just such terms as these? A wrong method of teaching reading, wrong I mean in the full educational and ethical sense, is also a case of pathological use of the psychophysical mechanism. A method is ethically defective that, while giving the child a glibness in the mechanical facility of reading, leaves him at the mercy of suggestion and chance environment to decide whether he reads the ‘yellow journal,’ the trashy novel, or the literature which inspires and makes more valid his whole life. Is it any less certain that this failure on the ethical side is repeated in some lack of adequate growth and connection in the psychical and physiological factors involved?

If a knowledge of psychology is important to the teacher in the grosser and more overt cases of mental pathology is it not even more important in these hidden and indirect matters—just because they are less evident and more circuitous in their operation and manifestation?

The argument may be summarized by saying that there is controversy neither as to the ethical character of education, nor as to the abstraction which psychology performs in reducing personality to an object. The teacher is, indeed, a person occupied with other persons. He lives in a social sphere—he is a member and an organ of a social life. His aims are social aims; the development of individuals taking ever more responsible positions in a circle of social activities continually increasing in radius and in complexity. Whatever he as a teacher effectively does, he does as a person; and he does with and towards persons. His methods, like his aims, when actively in operation, are practical, are social, are ethical, are anything you please—save merely psychical. In comparison with this, the material and the data, the standpoint and the methods of psychology, are abstract. They transform specific acts and relations of individuals into a flow of processes in consciousness; and these processes can be adequately identified and related only through reference to a biological organism. I do not think there is danger of going too far in asserting the social and teleological nature of the work of the teacher; or in asserting the abstract and partial character of the mechanism into which the psychologist, as a psychologist, transmutes the play of vital values.

Does it follow from this that any attempt on the part of the teacher to perform this abstraction, to see the pupil as a mechanism, to define his own relations and that of the study taught in terms of causal influences acting upon this mechanism, are useless and harmful? On the face of it, I cannot understand the logic which says that because mechanism is mechanism, and because acts, aims, values are vital, therefore a statement in terms of one is alien to the comprehension and proper management of the other. Ends are not compromised when referred to the means necessary to realize them. Values do not cease to be values when they are minutely and accurately measured.

Acts are not destroyed when their operative machinery is made manifest. The statement of the disparity of mechanism and actual life, be it never so true, solves no problem. It is no distinction that may be used off-hand to decide the question of the relation of psychology to any form of practice. It is a valuable and necessary distinction; but it is only preliminary. The purport of our discussion has, indeed, led us strongly to suspect any ideal which exists purely at large, out of relation to machinery of execution, and equally a machinery that operates in no particular direction.

The proposition that a description and explanation of stones, iron and mortar, as an absolutely necessary causal nexus of mechanical conditions, makes the results of physical science unavailable for purposes of practical life, would hardly receive attention to-day. Every sky-scraper, every railway bridge is a refutation, compared with which oceans of talk are futile. One would not find it easy to stir up a problem even if he went on to include, in this same mechanical system, the steam derricks that hoist the stones and iron, and the muscles and nerves of architect, mason and steel worker. The simple fact is still too obvious: the more thorough-going and complete the mechanical and causal statement, the more controlled, the more economical are the discovery and realization of human aims. It is not in spite of, nor in neglect of, but because of the mechanical statement that human activity has been freed, and made effective in thousands of new practical directions, upon a scale and with a certainty hitherto undreamed of. Our discussion tends to suggest that we entertain a similar question regarding psychology only because we have as yet made so little headway—just because there is so little scientific control of our practice in these directions; that at bottom our difficulty is local and circumstantial, not intrinsic and doctrinal. If our teachers were trained as architects are trained, if our schools were actually managed on a psychological basis as great factories are run on the basis of chemical and physical science; if our psychology were sufficiently organized and coherent to give as adequate a mechanical statement of human nature as physics does of its material, we should never dream of discussing this question.

I cannot pass on from this phase of the discussion without at least incidental remark of the obverse side of the situation. The difficulties of psychological observation and interpretation are great enough in any case. We cannot afford to neglect any possible auxiliary. The great advantage of the psychophysical laboratory is paid for by certain obvious defects. The completer control of conditions, with resulting greater accuracy of determination, demands an isolation, a ruling out of the usual media of thought and action, which leads to a certain remoteness, and easily to a certain artificiality. When the result of laboratory experiment informs us, for example, that repetition is the chief factor influencing recall, we must bear in mind that the result is obtained with nonsense material—*i. e.*, by excluding the conditions of ordinary memory. The result is pertinent if we state it thus: The more we exclude the usual environmental adaptations of memory the greater importance attaches to sheer repetition. It is dubious (and probably perverse) if we say: Repetition is the prime influence in memory.

Now this illustrates a general principle. Unless our laboratory results are to give us artificialities, mere scientific curiosities, they must be subjected to interpretation by gradual reapproximation to conditions of life. The results may be very accurate, very definitive in form; but the task of re-viewing them so as to see their actual import is clearly one of great delicacy and liability to error. The laboratory, in a word, affords no final refuge that enables us to avoid the ordinary scientific difficulties of forming hypotheses, interpreting results, etc. In some sense (from the very accuracy and limitations of its results) it adds to our responsibilities in this direction. Now the school, for psychological purposes, stands in many respects midway between the extreme simplifications of the laboratory and the confused complexities of ordinary life. Its conditions are those of life at large; they are social and practical. But it approaches the laboratory in so far as the ends aimed at are reduced in number, are definite, and thus simplify the conditions; and their psychological phase is uppermost—the formation of habits of attention, observation, memory, etc.—while in ordinary life these are secondary and swallowed up.

If the biological and evolutionary attitude is right in looking at mind as fundamentally an instrument of adaptation, there are certainly advantages in any mode of approach which brings us near to its various adaptations while they are still forming, and under conditions selected with special reference to promoting these adaptations (or faculties). And this is precisely the situation we should have in a properly organized system of education. While the psychological theory would guide and illuminate the practice, acting upon the theory would immediately test it, and thus criticize it, bringing about its revision and growth. In the large and open sense of the words psychology becomes a working hypothesis, instruction is the experimental test and demonstration of the hypothesis; the result is both greater practical control and continued growth in theory.

II.

I must remind myself that my purpose does not conclude with a statement of the auxiliary relation of psychology to education; but that we are concerned with this as a type case of a wider problem—the relation of psychology to social practice in general. So far I have tried to show that it is not in spite of its statement of personal aims and social relations in terms of mechanism that psychology is useful, but because of this transformation and abstraction. Through reduction of ethical relations to presented objects we are enabled to get outside of the existing situation; to see it objectively, not merely in relation to our traditional habits, vague aspirations and capricious desires. We are able to see clearly the factors which shape it, and therefore to get an idea of how it may be modified. The assumption of an identical relationship of physics and psychology to practical life is justified. Our freedom of action comes through its statement in terms of necessity. By this translation our control is enlarged, our powers are directed, our energy conserved, our aims illuminated.

The school is an especially favorable place in which to study the availability of psychology for social practice; because in the school the formation of a certain type of social personality, with a certain attitude and equipment of working powers, is the ex-

press aim. In idea at least no other purpose restricts or compromises the dominance of the single purpose. Such is not the case in business, politics, and the professions. All these have upon their surface, taken directly, other ends to serve. In many instances these other aims are of far greater immediate importance; the ethical result is subordinate or even incidental. Yet as it profiteth a man nothing to gain the whole world and lose his own self, so indirectly and ultimately all these other social institutions must be judged by the contribution which they make to the value of human life. Other ends may be immediately uppermost, but these ends must in turn be means; they must subserve the interests of conscious life or else stand condemned.

In other words, the moment we apply an ethical standard to the consideration of social institutions, that moment they stand on exactly the same level as does the school, viz.: as organs for the increase in depth and area of the realized values of life. In both cases the statement of the mechanism, through which the ethical ends are realized, is not only permissible, but absolutely required. It is not merely incidentally, as a grateful addition to its normal task, that psychology serves us. The essential nature of the standpoint which calls it into existence, and of the abstraction which it performs, is to put in our possession the method by which values are introduced and effected in life. The statement of personality as an object; of social relations as a mechanism of stimuli and inhibitions, is precisely the statement of ends in terms of the method of their realization.

It is remarkable that men are so blind to the futility of a morality which merely blazons ideals, erects standards, asserts laws without finding in them any organic provision for their own realization. For ideals are held up to follow; standards are given to work by; laws are provided to guide action. The sole and only reason for their conscious moral statement is, in a word, that they may influence and direct conduct. If they cannot do this, not merely by accident, but of their own intrinsic nature, they are worse than inert. They are impudent imposers and logical self-contradictions.

When men derive their moral ideals and laws from custom, they also realize them through custom; but when they are in

any way divorced from habit and tradition, when they are consciously proclaimed, there must be some substitute for custom as an organ of execution. We must know the method of their operation and know it in detail. Otherwise the more earnestly we insist upon our categorical imperatives, and upon their supreme right of control, the more flagrantly helpless we are as to their actual domination. The fact that conscious, as distinct from customary, morality and psychology have had a historic parallel march, is just the concrete recognition of the necessary equivalence between ends consciously conceived, and interest in the means upon which the ends depend. We have the same reality stated twice over: once as value to be realized, and once as mechanism of realization. So long as custom reigns, as tradition prevails, so long as social values are determined by instinct and habit, there is no conscious question as to the method of their achievement, and hence no need of psychology. Social institutions work of their own inertia, they take the individual up into themselves and carry him along in their own sweep. The individual is dominated by the mass life of his group. Institutions and the customs attaching to them take care of society both as to its ideals and its methods. But when once the values come to consciousness, when once a Socrates insists upon the organic relation of a reflective life and morality, then the means, the machinery by which ethical ideals are projected and manifested, comes to consciousness also. Psychology must needs be born as soon as morality becomes reflective.

Moreover, psychology, as an account of the mechanism of workings of personality, is the only alternative to an arbitrary and class view of society, to an aristocratic view in the sense of restricting the realization of the full worth of life to a section of society. The growth of a psychology that, as applied to history and sociology, tries to state the interactions of groups of men in familiar psychical categories of stimulus and inhibition, is evidence that we are ceasing to take existing social forms as final and unquestioned. The application of psychology to social institutions is the only scientific way of dealing with their ethical values in their present unequal distribution, their haphazard execution and their thwarted development. It marks just the rec-

ognition of the principle of sufficient reason in the large matters of social life. It is the recognition that the existing order is determined neither by fate nor by chance, but is based on law and order, on a system of existing stimuli and modes of reaction, through knowledge of which we can modify the practical outcome. There is no logical alternative save either to recognize and search for the mechanism of the interplay of personalities that controls the existing distributions of values, or to accept as final a fixed hierarchy of persons in which the leaders assert, on no basis save their own supposed superior personality, certain ends and laws which the mass of men passively receive and imitate. The effort to apply psychology to social affairs means that the determination of ethical values lies not in any set or class, however superior, but in the workings of the social whole; that the explanation is found in the complex interactions and inter-relations which constitute this whole. To save personality in all, we must serve all alike—state the achievements of all in terms of mechanism, that is, of the exercise of reciprocal influence. To affirm personality independent of mechanism is to restrict its full meaning to a few, and to make its expression in the few irregular and arbitrary.

The anomaly in our present social life is obvious enough. With tremendous increase in control of nature, in ability to utilize nature for the indefinite extension and multiplication of commodities for human use and satisfaction, we find the actual realization of ends, the enjoyment of values growing unassured and precarious. At times it seems as if we were caught in a contradiction; the more we multiply means, the less certain and general is the use we are able to make of them. No wonder a Carlyle or a Ruskin puts our whole industrial civilization under a ban, while a Tolstoi proclaims a return to the desert. But the only way to see the situation steadily, and to see it as a whole, is to keep in mind that the entire problem is one of the development of science, and of its application to life. Our control of nature with the accompanying output of material commodities is the necessary result of the growth of physical science—of our ability to state things as interconnected parts of a mechanism. Physical science has for the time being far outrun psychical.

We have mastered the physical mechanism sufficiently to turn out possible goods; we have not gained a knowledge of the conditions through which possible values become actual in life, and so are still at the mercy of habit, of haphazard, and hence of force.

Psychology, after all, simply states the mechanism through which conscious value and meaning are introduced into human experience. As it makes its way, and is progressively applied to history and all the social sciences, we can anticipate no other outcome than increasing control in the ethical sphere—the nature and extent of which can be best judged by considering the revolution that has taken place in the control of physical nature through a knowledge of her order. Psychology will never provide ready-made materials and prescriptions for the ethical life, any more than physics dictates off-hand the steam-engine and the dynamo. But science, both physical and psychological, makes known the conditions upon which certain results depend, and therefore puts at the disposal of life a method for controlling them. Psychology will never tell us just what to do ethically, nor just how to do it. But it will afford us insight into the conditions which control the formation and execution of aims, and thus enable human effort to expend itself sanely, rationally and with assurance. We are not called upon to be either boasters or sentimentalists regarding the possibilities of our science. It is best, for the most part, that we should stick to our particular jobs of investigation and reflection as they come to us. But we certainly are entitled in this daily work to be sustained by the conviction that we are not working in indifference to or at cross-purposes with the practical strivings of our common humanity. The psychologist, in his most remote and technical occupation with mechanism, is contributing his bit to that ordered knowledge which alone enables mankind to secure a larger and to direct a more equal flow of values in life.

PROCEEDINGS OF THE EIGHTH ANNUAL MEETING
OF THE AMERICAN PSYCHOLOGICAL ASSOCI-
ATION, YALE UNIVERSITY, NEW HAVEN,
CONN., DECEMBER, 1899.

REPORT OF THE SECRETARY FOR 1899.

The eighth annual meeting of the American Psychological Association was held at Yale University, New Haven, Conn., December 27, 28 and 29, 1899, in affiliation with the American Society of Naturalists. The President of the Association, Professor John Dewey, of Chicago, presided at the meeting, at the various sessions of which there were fifty-six members in attendance. The members of the Association were present at the discussion before the Naturalists on the afternoon of the 28th, in which Professor Joseph Jastrow represented the Psychologists, the subject being 'The Position that Universities should take in regard to Investigation.' The members also attended the annual dinner of the Affiliated Societies held at the New Haven House on the evening of the 28th as well as the general reception extended to the visiting societies by Yale University on the evening of the 27th.

Two business meetings were held at which the following was transacted: Election of officers for 1900: *President*, Professor Joseph Jastrow, University of Wisconsin; *Members of the Council, to serve for three years*, Professor George T. Ladd, Yale University, and Professor William L. Bryan, Indiana University.

The following new members were elected: Professor J. A. Bergström, Indiana University; Dr. Henry Davies, Yale University; Dr. G. V. N. Dearborn, Harvard University; Dr. George B. Germann, Columbia University; Professor G. W. A. Luckey, Columbia University; Professor Lillie J. Martin, Leland Stanford Jr. University; Professor E. B. McGilvary, Cornell University; Professor Alexander Meiklejohn, Brown University;

Dr. Max Meyer, Clark University ; Dr. A. H. Pierce, Amherst College ; Dr. S. H. Rowe, New Haven, Conn. ; Professor Carl E. Seashore, University of Iowa ; Dr. Ellen Bliss Talbot, Troy, N. Y. ; Professor J. H. Tufts, University of Chicago ; Mr. Clark Wissler, Columbia University ; Dr. R. S. Woodworth, University and Bellevue Medical School, N. Y.

Professors Ladd and James were appointed delegates of the Association to the International Psychological Congress to be held in Paris in 1900, and power was given to the Council to appoint other delegates in its discretion.

The Council was also empowered to call a meeting of the Association in June, 1900, in connection with the meeting of the American Association for the Advancement of Science to be held in New York at that time.

Upon motion of Professor Jastrow it was voted that the Association looked with favor upon the proposition to hold the annual meeting of 1901 in Chicago.

Upon recommendation of the Council the Treasurer was directed to pay, from the funds of the Association, the sum of fifty dollars to Professors Bryan and Lindley, to be used in the continuation of their investigation of the mathematical prodigy now under their charge.

The question of the arrangement of the program of the annual meeting with respect to technical papers and consequent formation of sections was actively discussed, but no definite instructions were given to the Committee of Arrangements. The Council was empowered to appoint a secretary to take charge of the arrangement of papers for the philosophical section.

Owing to the length of the program, the committee had followed the plan of dividing into sections on the morning of the 28th and on the 29th.

REPORT OF THE TREASURER FOR 1899.

DR.

To balance at last meeting.....	\$800 88
Dues of members.....	297 00
	<hr/>
	\$1097 88

CR.

By expenditures for

Postage, telegrams, etc.,.....	\$17 70
Stationery,	15 40
Printing, clerical work, etc.,.....	14 10
Expenses of meeting,.....	9 30
	<hr/>
	\$56 50

Balance on hand,.....\$1041 38

Audited by the Council and found correct.

LIVINGSTON FARRAND,
Secretary and Treasurer.

ABSTRACTS OF PAPERS.

Address of the President: *Psychology and Social Practice.*

By JOHN DEWEY.

The speaker discussed the relation of psychology to education considered as a form of social practice with which psychology might be expected to have most immediate concern, and then generalized the results reached to draw certain conclusions regarding the general value of psychology as a method to be applied in social life. He first pointed out certain psychological presuppositions controlling existing educational theory and practice: (1) the assumption of identity between the mental attitude of the child and the adult, overlooking the growth of specialized habits and aims in the latter, and the subordination of other considerations to questions of growth in the child; (2) the assumption of difference where identity is found, viz.: the motives which direct attention and secure mental power. An insight into the true psychology of the case on the part of both educational theorists and school instructors was pointed out as necessary to any intelligent and effective reform.

The objection that psychology deals with its material as objective and as mechanism, while education is concerned with living personalities, was then taken up; the purport of the discussion was to show the necessity of the statement of life functions and attitudes in terms of objective mechanism for the purpose of effectively directing them. The conclusion was drawn that it was not in spite of, or by ignoring, mechanical state-

ment that the ethical aims of education are subserved, but because of it.

Taking this conclusion as typical it was then argued that wherever it is a problem of reaching certain ends (that is wherever morality becomes consciously reflective) there is a demand for knowing the mechanism or method by which the end may be reached; that accordingly a reflective, as distinct from a customary, morality, and an attempt to get a psychological statement, were born and have grown *pari passu*.

(The address appears in full in the March number of the PSYCHOLOGICAL REVIEW.)

Discussion: *How Should Psychology be Taught?* The discussion was formally opened by PROFESSORS FULLERTON, JASTROW, AIKINS and JUDD, and continued by a number of members from the floor.

By PROFESSOR FULLERTON.

Professor Fullerton stated that he would make no attempt to cover the ground indicated by the title, and that he would not touch upon those pedagogical maxims common to psychology with many other disciplines, but that he would confine himself to one or two points of especial interest at the present time, owing to the developments of recent years. He spoke, in outline, as follows:

1. Certainly one of the most important questions which can face the teacher of psychology at the present day is the question of the adjustment of the relative claims of what have been somewhat unfortunately termed the New Psychology and the Old, the psychology of the laboratory and the statistical circular, and that which depends largely upon introspection and reflective analysis. There appears to be some danger that the one or the other may be unduly emphasized, when it is desirable that each should receive its due.

It may be impossible, in any given case, to give to the student even a brief course in the psychological laboratory. But this should be omitted only from stern necessity. The laboratory (*a*) awakens in the student's mind a realization of the

fact that psychology really is a natural science, and it yields him at least *some* exact information; (*b*) it gives the student a *standard of exactitude*, and he may hold this before him as an ideal even in those parts of psychology where the attainment of such an ideal is at present out of the question; (*c*) it helps to free the student from the bondage to tradition, which perpetuates error even when the means for its correction are not beyond our reach.

But it appears to be easy for some to overlook the fact that a large part of psychological doctrine is at present neither physiological nor experimental. This is clear to any one who examines with a critical eye the current systematic treatises on psychology—many of them written by men who have been trained in the laboratory. A large part of their contents have little direct connection with laboratory work, and rest upon the methods employed by what has been called the Old Psychology. The laboratory worker may or may not be a good man to teach this part of psychological doctrine, or, for that matter, to publish books upon it. It is an error to suppose that the whole of psychology should be relegated to the man in the laboratory and regarded as peculiarly his property. In the teaching of psychology emphasis should be laid upon this part of the science, as well as upon that which lends itself to exact experiment. There seems to be more danger of such one-sidedness here in America, where specialization in psychology has been pushed to its extreme limit, than there is elsewhere.

2. A second point of a good deal of living interest is the question whether the teacher of psychology—here it is chiefly the graduate instruction that is concerned—should devote his energies chiefly to enabling the student to publish some creditable piece of original work by the time he is ready to finish his course, or should make it his first effort to give him a thorough knowledge of the field as a whole, relegating to a second place the original work to be done in this or that part of the field. Something may be said on both sides of the question, but, in view of the present trend of public opinion, it may be well to point out the danger of excessive specialization. Some kinds of original work are in their nature broadening, but some are not.

A student may do some very useful pieces of work, and spend a disproportionate time in doing them, without being himself much profited by the work he has done. He may, in this case, finish his course, and find a position as a teacher when he is quite unfit to fill such a position creditably to himself or with advantage to the institution to which he goes. It is difficult to lay down any general rule, but the matter is one deserving attention, and a more thoughtful attention than it at present receives in some quarters.

By PROFESSOR JASTROW.

Professor Jastrow expressed the view that the discussion of 'How psychology should be taught,' was inseparably linked with that of 'What shall be taught?' and this in turn as a practical problem referred mainly to what shall be taught to the large introductory classes in colleges and universities. In answer to the practical aspect of the latter question Professor Jastrow laid fundamental emphasis upon bringing before the student such problems, for the data and principles of which he could be referred to the analysis of his own experience; the student must be infused with the conviction that the study of psychology does not involve altogether novel and abstruse material and strange methods of regarding this material, but that its comprehension depends intimately and constantly upon a common sense interpretation of daily and verifiable experiences. It is concerned with a systematic explanation of the student's mental functions; and this functional aspect of psychological problems is the one which, in the speaker's opinion, should dominate the manner of presenting psychology to the student. The one topic which seems pedagogically best suited to this end is the study of sense-experience, and the manner of deriving from it the information which all normal individuals possess. An essential and considerable part of an introductory course in psychology would consist of a series of demonstrations and explanations of sensory functions, of the kind of information which each of the special senses yields, and of the manner in which such information is obtained. Of other 'functional' problems coördinate in importance with this may be mentioned the general relations of

the constituent parts of conduct—the receptive processes, reflection, and coördination and movements or action—to one another and to the nervous system; the various degrees and kind of such conduct—arcs from the reflex to those of an elaborate voluntary type and so on. Regarding this ‘functional’ aspect as of greatest value in the teaching of psychology it follows that methods of greatest practical effectiveness would be sought and developed in the presentation of these topics. For most classes the demonstrational method seems both expedient and successful, but also demands the usual educational methods in vogue in introductory courses.

Supplementary to this and following upon it should be presented a clear and concise review of those aspects of mental experience which can best be studied by the light of introspection; and it should be made evident that many of the data utilized in the exposition of ‘functional’ principles were largely dependent upon introspective evidence. In this connection the broad field of psychological phenomena, their connection with problems in cognate fields would naturally be presented, and an incentive be given for the student to pursue his studies along any of the lines which has appealed most strongly to his interests. And it would be well for both teacher and taught to feel and reflect as little as possible of the differences between what are misleadingly called ‘experimental’ and ‘introspective’ psychology, but to infuse the teaching with the spirit of solidarity and significance of the knowledge of mental phenomena.

By PROFESSOR AIKINS.

Professor Aikins spoke in part as follows: My problem has been the practical one of constructing an elementary course that correlates text-book and experiment; that moves gradually from a familiar outward attitude towards mental facts and rough physiological explanations to introspective analysis and the more speculative problems; and that is concrete enough in the main to interest the average non-metaphysical student. The method I have finally adopted to solve my problem is this:

I begin with a general explanation of the nature of the reflex arc, and then take up the localization of function in the cord

and brain. I show how this proves the complexity of ordinary perceptions and thoughts, how it disproves the common absolute distinction between perception, memory and imagination, and so on; but what I dwell on most is the question why a neural discharge should travel to one center rather than to another and the conditions that determine its strength and duration.

Here comes in the experimental work. It is based upon the collection of experiments made by Professor Sanford; but I have tried to re-classify them according to the general tendencies of nervous action which they seemed to indicate or exemplify, and I succeeded in making a place for most of them under one or other of the following heads: Law of Diffusion, Law of the Threshold, Summation of Successive Stimuli, Reinforcement of Different Discharges by Each Other, Persistence of Neural Processes, Inhibition, the Effects of Novelty and Habit, the Law of Sudden Attainment, the Law of Dissociation or Forgetting, Fatigue, Rhythmic Functioning, the Order of Development, Brain Processes and Consciousness. These general tendencies or empirical laws of neural action I put together in a typewritten syllabus, and afterwards more fully in lectures, in each case stating the law and explaining its existence as well as I can and then giving examples arranged so as to show the extent of the tendency.

Having gone over these laws I take up all the topics in the text-book which can be treated from the standpoint of the reflex arc, and try to show in each case how the laws help to determine the form that the arc will take. Even Will I treat here as growing out of a conflict between several incompatible tendencies of the reflex type.

In the second part of the course I go over the ground again from the introspective standpoint, point out the aspects of mental life which no laws of nervous action can explain, and outline the historical speculative problems.

Such an arrangement of the work seems to me logical; it covers the ground fairly well; and with my students I think it works better than any other that I have tried.

By PROFESSOR JUDD.

Professor Judd held that the student finds in psychology certain difficulties which do not appear in his study of the other sciences. In physics, for example, the transition from observed facts to inferred interpretations is not so distinctly marked as to attract the attention of the student and impress upon him the indirect character of all inference. In psychology, on the other hand, because observation deals with the directly known facts of immediate experience, while inference always extends beyond the sphere of directly observed facts, the student becomes clearly conscious of the difference between observation and interpretation. He is frequently led to question the inferred facts because of the indirect method of arriving at them. This difficulty will be avoided if the first part of the course in psychology consists of a study of the indirect modes of treating subjective experience, that is of a study of the physical and physiological conditions of mental life. Such a study of conditions must not, however, be allowed to become pure physiology; it should always keep clearly in view its relation to the final treatment of mental experience towards which it is aiming. And the course should never be allowed to come to a close until the study of conditions with which it started has been extended so as to give a systematic view of the descriptive phases of psychological science as well as a view of the interpretation of psychical facts in their relations.

Volition as a Scientific Datum. By EDWARD FRANKLIN BUCHNER.

The paper discussed a tendency which characterizes current psychology, to rule out the volitional process. It presented an analysis of volition which entitles it to be placed among 'primitive' processes, while maintaining that it never is given as a pure process, but it is always found in constant relation with all contents of consciousness. Thus volition is ready and able to explain, in a psychological manner, rather than in need of explanation itself. To eliminate volition would be a virtual subversion of scientific psychology, so long as it is developed with the intent of representing the nature of mental activity and the course of its development.

The Criterion of Sensation. By GEORGE STUART FULLERTON.

This paper was a continuation of the train of thought developed in a paper entitled 'The Psychological Standpoint,' read before a former meeting of the association, and which endeavored to show what is implied in the recognition of psychology as a natural science.

The present paper treated the same theme in a more limited field, maintaining that the criterion of sensation offered by psychology as natural science—the reference to the peripheral nervous system—is one which can be regarded as ultimate only for convenience of discussion within a definite field of investigation; that the psychologist must ultimately rest upon the criterion recognized as final by the epistemologist; and that the contradiction in the psychological standpoint, the quarrel between the doctrine of representative perception and the assumption that we immediately perceive a real world, is eliminated when one recognizes the fact that, although the distinction between things and the percepts through which they are known is final for psychology as natural science, it is not in the same sense final for epistemology. It was maintained that the psychologist is quite justified in assuming that he immediately perceives a world of real things, and that he may begin with this initial assumption in building up his system of doctrine. But it was further maintained that he must hold faithfully to his doctrine of representative perception, and not endeavor to render his procedure consistent by asserting that the mind immediately perceives things and percepts alongside of each other, a doctrine which is subversive of the very foundations of psychology when carried out in its consequences. The psychologist should, it was held, leave his defense to the epistemologist, and be content with an inconsistency which works no harm in practice, and which is an inconsistency, after all, only when looked at from the plane of the common understanding.

(The paper is printed at length in the *PSYCHOLOGICAL REVIEW* for March, 1900.)

An Arithmetical Prodigy. By E. H. LINDLEY and W. L. BRYAN.

Arthur Griffith, born 1880, at Milford, Indiana, son of a stone-mason; had a passion for counting from the age of three; entered school at the age of ten; attended school seven years; made a fair record in all studies; came to Indiana University to be investigated November, 1899.

Investigation covered following points: (1) general physical and mental organization; (2) sensory and motor capacities; (3) memory and type of imagination; (4) rapidity of calculation; (5) conditions of rapidity; (6) origin and significance of his methods.

The principal results are as follows: In scope and tenacity of memory and in rapidity he ranks among the best recorded cases. He is unique in the large number of methods which he has worked out and in the fact that he explains how and when he arrived at these. His memory is of the systematic type. His rapidity is found to depend upon the great number of number relations committed to memory, and upon the reduction in the number of operations through short-cut methods.

The boy gave demonstrations before the Association on Wednesday and Thursday.

Moral Perceptions of School Children. By WILL S. MONROE.

The speaker traced the development of the moral sense from the spontaneous outgoings of sympathy for animals to its higher reaches of sympathy for human beings. His thesis was illustrated by the interest of a set of school children in a tame crow. Sympathy was the dominant characteristic of the study, and this real and profound sympathy for the crow he thought unmistakable evidence of the development of the moral sense, growing out of a vague gregarious instinct, doubtless, but nevertheless training the moral sense of these young people for adjustments to human relations in the larger experience of the later life.

Individual Tests of School Children. By E. A. KIRKPATRICK.

Children of all grades from the first to the eighth were tested: (1) as to rate of counting, (2) rate of making vertical

marks, (3) sorting cards according to oral direction, (4) sorting cards according to visual direction and (5) tendency to see ink spots as objects. The results showed general improvement in the first four tests up to about the sixth or seventh grade, when the climax was reached. In the fifth test the children were best in the first grade and poorest in the fourth, fifth and sixth.

These results taken in connection with those obtained by others and interpreted in the light of the laws of decreased effects of practice as the limit of improvement is approached, and the theory of child development that some powers naturally mature before others, indicate that tests of individual ability cannot be properly interpreted till we know what mental activities are naturally most prominent at the age of the person tested, for a high record in a test of powers naturally developed earlier, may indicate that the development of higher powers has been arrested while elementary ones have continued to improve. It is therefore necessary to devise tests that can be given not only to university students, but also to children of all ages before we can properly interpret the results of tests of university students.

The children of each grade were arranged in three groups according to ability by their teachers and by their record in these tests, with the result that for 57 per cent. the two groupings agreed, while only 2 per cent. differed by two points. Such tests would probably be valuable in doubtful cases of promotion and classification.

The Reliability of Certain Methods for Measuring the Degree of Fatigue in School Children. By T. L. BOLTON.

The method of Griesbach and the method of the ergograph are under consideration. Do the sensory circles vary directly with the degree of fatigue as Griesbach affirms? And can all reductions in muscular power be referred back to fatigue for a cause or will fatigue be followed always by reductions in muscular power? Can the æsthesiometer and the ergograph be used to diagnose the fatigue condition of school children? Is it possible, as the followers of Griesbach have tried to do with the æsthesiometer, and Kemsies with the ergograph, to deter-

mine the fatigue value of each subject of the school curriculum? Determinations of the space-threshold were made before and after different periods of severe mental work, the work beginning always at the same time of day. The method of minimal changes was employed to make the determinations of the space-threshold. In the first series of experiments very slight increase was observed in the space-threshold after mental work, but in a subsequent series of experiments made under the same circumstances this increase in the space-threshold disappeared. In a third series of experiments for fifteen days, determinations of the space-threshold, combined with ergograph test, were made before and after two-hour periods of mental—adding—work, five two-hour periods of walking and five two-hour periods of resting. The purpose was to test the different influences of mental work, bodily exercise and rest. The space-threshold was found not to vary regularly under any of these influences. The performances with the ergograph were considerably increased after mental work, decreased to an equal amount by two hours' bodily exercise and remained practically unchanged after a two-hour period of rest.

The conclusions were that severe mental work for two hours does not affect the space-threshold sufficiently to be detected by the æsthesiometer, that this instrument is not adapted to the diagnosis of fatigue conditions in school children, that all reductions in the power of muscular endurance are not significant of fatigue, and that this instrument also is not adapted to measuring the degree of fatigue in school children.

Preliminary Report on Some Tests of Individual Sense Types. By HOWARD C. WARREN. (Read by title.)

A New Number Form. By EDWARD FRANKLIN BUCHNER.

This contribution presented a description, accompanied with charts, of tri-dimensional forms for numbers from 1 to 100, for the days of the week, and for the months of the year, possessed since her early childhood by a woman thirty-six years of age. No explanation for the genesis of the forms was derived from their history.

On the Time-values of Accented and Unaccented Elements in Rhythm. By ROBERT MACDOUGALL.

A Method of Securing Enlarged Records of Voice Vibrations.
By CHARLES H. JUDD.

This paper reported a simple, direct method of securing on smoked paper enlarged records of voice vibrations together with a parallel time record. The diaphragm used in this method consists of thin tracing paper drawn tightly over the end of a shallow wooden speaking tube. The central area of the diaphragm is rendered rigid by pasting a small disk of cardboard to the paper. This central rigid area serves to concentrate at the center all the energy expended upon it, thus giving vibrations strong enough to move the levers. The recording lever which is connected with this diaphragm is horizontal in position and is made of straw. The greatest possible freedom of movement and the least possible weight are thus secured. As a test for the efficiency of this diaphragm and lever a string was connected with the recording arm, not, it will be noted, with the diaphragm, and led to a second diaphragm. Whatever vibrations are produced in this second diaphragm will be recorded on the smoked paper. It was found that the second diaphragm reproduced clearly the articulations received at the first diaphragm. Records made by the method described were exhibited and the analysis of a four-syllable word was reported in detail.

Researches in Experimental Phonetics. By E. W. SCRIPTURE.

Elements of a Psychological Theory of Music. By MAX MEYER.

The present theory of music is based on the diatonic scale of seven notes represented by the relations 24, 27, 30, 32, 36, 40, 45. The other tones are considered as intercalated tones, bearing no relation to the scale. In the present theory only 2, 3 and 5 relations are considered as harmonious; the 7 relations are not so considered.

In order to perfect the theory of music we utilize the 7 relations. The mind does not grasp relations more distant than 7

relations, hence these may be disregarded. Besides insisting upon the use of the 7 relations, we divide all tone groups into two classes: groups containing the 2 relation, and groups made up of the 3, 5 and 7 relations, the 2 relation being omitted. We thus make clear many of the æsthetic effects of music.

Is There an Independent Auditory Space? By A. H. PIERCE.

The peculiar structure of the sense-organ of hearing, and the inevitable fact that auditory spatial determinations are subordinated to those of sight and touch, have led the majority of psychologists to deny the possibility of an independent auditory space. It is claimed that all apparently spatial auditory experiences are really accomplished by a systematic *borrowing* from the visual and tactual fields. Thus localizations of sound are said to be 'transferred' localizations.

An independent auditory space could be posited with assurance if definite localizations of sound could be shown to take place under circumstances which absolutely preclude the coöperation of visual, tactual and motor factors. Now, just these conditions are fulfilled by the so-called 'intracranial localizations.' Such localizations occur when two fusing sounds are given simultaneously, one at each ear and in close proximity to the head. These are genuine auditory phenomena, and the spatial determinations to the interior of the head are as immediately and confidently accomplished as when the sound is located externally. Here then we have facts that are decisive in favor of an independent auditory space. For these localizations cannot have been made by the aid of factors borrowed from the other space fields.

Still, though we may believe that an auditory space with its peculiar laws and apparent caprices is no fictitious affair, we must freely confess that it must forever remain in a subordinate position among the spaces. For there are no extended auditory objects, and auditory localizations are too liable to be faulty to satisfy the demands of daily life.

Some Experiments on Motor Diffusion. By CLARK WISSLER.

Some experiments were reported showing the time relations

between the primary contractions of finger muscles and the accompanying secondary contractions of the other arm muscles. By primary contractions are meant those intentionally made, and by secondary those accompanying unintentional movements due to a diffusion, or spread, of the motor discharge. The time relations were measured by graphic means. The results lead to the conclusion that in case of arm muscles the primary contractions are first in order of time and followed by secondary contractions in an order corresponding to their distance anatomically from the muscle innervated. This time order taken in connection with the fact that secondary contractions occur on the other side of the body leads to the view that this phenomenon is the result of an irradiation of the discharge from the primary center in the cortex. That this diffusion takes place in both directions is indicated by the fact that training the muscles of the fingers also trains the other arm muscles and training the biceps in turn trains the finger muscles. From this point of view transference of practice effect is simply the result of diffused nerve currents.

(Printed in full in the *PSYCHOLOGICAL REVIEW* for January, 1900.)

The Influence of Special Training on General Ability. By
E. L. THORNDIKE and R. S. WOODWORTH.

Dr. Thorndike and Dr. Woodworth reported the results of some experiments seeking to determine the influence of special training on general ability. The abilities studied were (1) the speed and accuracy of making certain complex observations, *e. g.* of picking out from a page of print all the verbs or all the words containing both *r* and *e*; (2) the recognition of weights, lengths and sizes; (3) attention to and retention of names; (4) discrimination of two complex objects shown successively.

In the first of these experiments subjects were given a test of ability to recognize accurately a number of different combinations of letters before and after a period of practice in recognizing some one combination.

In the second series of experiments different sense judgments were studied by a method somewhat resembling that of

average error. The preliminary test consisted, for instance, in the estimation of the absolute lengths of lines 6-12 inches long. The subject was then given a set of cards on which were lines ranging from $\frac{1}{2}$ -1 $\frac{1}{2}$ inches, and trained himself by correcting his errors until he could tell the length of any such line to an eighth of an inch, with very few mistakes. He was now re-tested in estimating the longer lines. A similar method was employed in the perception of areas, weights, etc.

The third and fourth series of experiments were class-tests tried on first- and second-year medical students. The special training was in this case supplied by the first year's work of the medical course. Since this year introduces the student to a vast amount of practice in learning names and in observation along the lines of anatomy, histology, chemistry, etc., it was argued that if any special training could improve the general powers of retention of names and of observation, this year's work should do so.

These experiments unanimously failed to detect any pronounced influence of special training on general ability, but are not conclusive.

Unsatisfactory Elements in Current Views on Light and Color. By A. KIRSCHMANN. (Read by title.)

On Relations of Time and Space in Vision. By J. McKEEN CATTELL.

When a moving surface is exhibited as it passes under a window in a screen it appears larger than the window. If green is exhibited first for $\frac{1}{30}$ second, followed by red for $\frac{1}{30}$ second, the observer does not see green followed by red, but the two colors are seen side by side, variously arranged and intermingled, filling a larger area than the window through which they are seen. A series of physical and physiological processes in time makes for perception a spatial continuum. In this case, however, the same physical stimulus gives rise to entirely different perceptions with different observers, indicating that the processes of visual perception are largely built up by the individual.

When in the ordinary vision of daily life the line of sight

moves over objects, say the books on a shelf, each retinal element is successively stimulated, but the objects are seen simultaneously, side by side. In this case the intermittent stimulations may occur as rapidly as 1,000 per second without any fusion or blurring. This fact indicates that fusion and, indeed, all the phenomena of color-vision are cerebral rather than retinal.

These experiments, demonstrating as they do that a time series is perceived as a space continuum when this is advantageous for our reactions, show anew that our perceptions are not 'copies' of a physical world or correlates of simple physiological processes, but are dependent on experience and utility.

An Effect of Eye Movements in Visual Perception of Space.

By C. E. SEASHORE. (Read by title.)

Conditions Affecting the Judgment of the Direction of Lines.

By E. D. DELABARRE.

In the judgment of the vertical, beside the factors usually recognized, the following are of especial importance: (1) attention-fixation does not usually coincide with eye-fixation, though the observer ordinarily assumes that it does; instead, the eye-fixation wanders much unconsciously on either side of the supposedly fixated line, and causes it to appear constantly changing in degree and direction of inclination; (2) muscle-strains in head and eye also influence the apparent inclination.

These same influences affect also other judgments of direction, and likewise judgments of length and distance. Certain conditions—of illumination, attracting points in the field, and arrangement of lines—produce definite strains and tendencies to fixation of particular kinds. These furnish a fundamental explanation for many forms of geometrical-optical illusion.

Recent Studies in the Clark Laboratory. By E. C. SANFORD.

Dr. Sanford reported briefly upon three studies with the following titles:

1. The Development in School Children of the Ability to Reproduce Rhythms.
2. The Rhythm of Nursery Rhymes.
3. The Mental Process of the White Rat as Tested with the Maze.

The first and last of these are portions of more extended studies of the general topics of rhythm and comparative psychology, and all are expected to appear in the *American Journal of Psychology* during the coming year.

Pending Problems at the Wisconsin Laboratory, with Demonstration of Some Optical and Other Apparatus. By JOSEPH JASTROW.

Professor Jastrow demonstrated various pieces of apparatus, many of them connected with the study of problems in visual perception. The Wood pseudoscope, and the reflecting stereoscope, which also enables one to combine ordinary stereoscopic views either stereoscopically or pseudoscopically (see *PSYCHOLOGICAL REVIEW*, January, 1900), were exhibited and their modus operandi explained. A device for simplifying the demonstration of retinal shadows (Le Conte's experiment) was shown. Attention was also called to the fact that red and green spectacles and appropriate red-green prints, for stereoscopic vision, were now commercially available; and that a set of mathematical curves in red-and-green stereoscopy, better suited for demonstrations than miscellaneous prints, was about to be published. The demonstration further included a brief account of experiments in progress on the power of distinguishing in a shadowless light between convex forms varying slightly and regularly in degree of convexity; and of a simple reconstruction of a typewriter by means of which this instrument could be made to serve a variety of psychological purposes, most of them connected with the study of practice and the acquisition of efficiency. The sorting apparatus (*PSYCHOLOGICAL REVIEW*, May, 1898) was exhibited in its perfected and portable form.

Demonstration of New Apparatus. By E. W. SCRIPTURE.

Physical Psychology. By A. H. LLOYD. (Read by title.)

The 'Natural History' Point of View in Psychology. By E. H. GRIFFIN.

Can the differentiation of psychology from ultimate inquiries be carried to the extent of excluding all postulates that may be characterized as metaphysical?

The analogy of other natural sciences is incomplete, since they disregard presentation in consciousness. They abstract their material from the knowing subject, and treat it as independently given, whereas psychology takes as its special theme the subjective aspect which the other sciences neglect. It is not difficult for the physicist or the chemist to avoid raising any question as to the nature of being, or the basis of knowledge, but such questions are obtruded upon the psychologist because the essence of his facts is their character as modifications of a conscious self. Many important phases of psychical experience must be left unexplained, if the dictum, "Let psychology treat its material as the other sciences treat theirs," is strictly adhered to. Perception must be handed over to the epistemologist. The psychologist may describe, and analyze, and determine the genetic conditions of the states of consciousness which we call perception, but he cannot deal with their cognitive value as purporting to reveal an external world. The validity of reasoned knowledge also lies beyond his province; to establish the veracity of the reasoning function the resources of another science must be invoked. The continuity of experience in memory cannot be discussed in terms of a merely descriptive psychology. "The will must be reduced to a complex of sensations, if, in this sense of the word science, it is to be scientifically treated. The title of Professor Münsterberg's striking article, 'Psychology and the Real Life' (*Atlantic Monthly*, May, 1898), suggests the fundamental criticism that may be made upon the 'natural science' point of view when illegitimately extended. The will analyzed by the psychologist is not, we are told, the real will, but is an artificial abstraction from it containing only its sensational elements. Is an abstraction that is distinctly misleading justifiable? When an investigator isolates a certain property from others and treats it as independent, or employs a symbol, or constructs a hypothetical entity like the other, these devices are not supposed to misrepresent the facts which they set forth.

The exclusion of epistemology and metaphysics from psychology is, within certain limits, desirable. It is evidently expedient to set apart certain psychophysical phenomena for treat-

ment after the methods of empirical science. But the ontological implications of experience must be acknowledged by the psychologist as soon as he passes beyond what may be called the sensational life. Perception, and memory, and reasoning, and attention—not to speak of the æsthetical and ethical emotions, and the higher determinations of choice—cannot be comprehended from a merely psychophysical standpoint.

Kant's Doctrine of Apperception and the Categories. By J. H. HYSLOP.

The main object of this paper was to show that Kant's doctrine of apperception contained a variety of processes which ought to be distinguished from each other. In order to indicate this fact a criticism of the Kantian categories was presented with a view of showing that those of relation and modality had been excluded from formal logic and only those of quantity and quality retained. The effect of this is to make the problem of knowledge extra-logical and to necessitate a recasting of both the problem of judgment and the categories. As a venture, therefore, in regard to both these questions the paper endeavored to indicate merely that the categories, in so far as the main question of content as distinct from conviction is concerned, might be reduced to one type, namely, that of Sufficient Reason, which was subdivided into the *Ratio Fiendi* and the *Ratio Essendi*, the former that of efficient and the latter of material cause. These were then shown to determine the contents of the two fundamental types of judgment to which all forms of judgment were reducible, namely, the intensive and the extensive judgment. The intensive judgment has to do with the relation between substance and attribute, and the extensive the relation between species and genus. The first of these applies the category of causality in some form and the latter that of comparison, or identity and difference.

Kant's doctrine of apperception was shown to comprehend too many processes to be as simple as it was supposed, and on that account gets into the difficulties of affirming the *Ding an sich* and yet not needing it for the extensive judgment which for Kant practically exhausted the problem of knowledge, though

he did not originally intend that it should be so. Consequently, by distinguishing between the *universal* and the *singular* judgment in the problem of knowledge and also between the *ordo cognitionis* and the *ordo naturæ*, we can start with the predicate in the intensive judgment and obtain a subject through the category of causality by an immediate process which does not assert more than the necessity of a subject to account for the predicate as a phenomenon, leaving all questions as to farther meaning either unsolved or open to later discovery. This process is one that excludes the application of the principle of identity from the determination of the primary judgment in knowledge.

Pragmatism. By WILLIAM CALDWELL.

Metaphysical Method. By J. A. LEIGHTON.

The problem of metaphysics is to discover a final ground for the relation assumed to exist in theory and practice between the finite subject and the rational objective order which the conscious activities of the subject, both theoretical and practical, imply. The method must recognize that thought and will are complementary and inseparable phases of the subject's activity and that the relation of the latter to the objective order is a developing one. While, before Kant, analysis and synthesis were both used, they were not combined in a living unity but, under the influence of mathematics, stood only in an external relation to one another. The method sees analysis and synthesis as the complementary aspects of a dynamic relation of the subject to the objective order. Hence the true method will find the metaphysical ground in the *life-history* of the finite consciousness as the latter develops by an immanent process in relation to an objective order, which while it responds to the movement of the finite subject and is in dynamic relation to the latter, nevertheless, as the organic wholeness of finite subjects, is forever a complete unity. The method recognizes in art, morality and religion relatively full experiences of this unity, but shows that these immediate experiences can be understood only in relation to the dialectic development of the self which has them.

The Concept of Substance. By ALEX. MEIKLEJOHN.

The purpose of this paper is to define the term 'substance' as used by Aristotle and Kant. For the former, a substance is an 'object of predication'; for the latter it is also a 'permanent object.' The task then is to define the thought, 'a permanent object of predication.' The concept cannot be abolished from thought, nor can it be declared indefinable. As Aristotle tells us, without this notion no predication is possible, and hence the interests of clear thinking demand that we know what our own term means. Locke's analysis of the concept is destroyed by Hume; and, further, his assertion that an object is unknown when its qualities are known is evidently false, as an account of the relation of substance and quality. The view which identifies substance with 'essence' or 'essential nature' is also untenable. To hold it is to declare objects identical in 'essence' to be identical as substances, *i. e.*, as individual objects. The truth is that the thought 'substance' is not qualitative or descriptive, but existential and demonstrative. In Aristotle's phrase 'this particular object' there is no description of the object, but only a singling of it out as 'this existent.' And when we regard the object as permanent we do not mean that it is unchanged in nature, but that it is unchanged in 'separate existence'; it is still 'this existent' whenever then we single out an object of attention of which to affirm qualities and change of qualities, together with the thought of qualities is the existential and demonstrative element, which constitutes our notion of substance.

The Influence of Philosophers on Public Opinion. By ALBERT SCHINZ. (Read by title.)

Practical Procedure in Inference. By JOHN GRIER HIBBEN.

In the various processes of actual reasoning we find a departure from the traditional syllogistic form, and that in several particulars.

1. There is usually a suppressed premise. The term euhymeme is misleading, implying that the omitted premise is expressed in thought though not in words, whereas the question

suggests itself whether the omission in language does not indicate a like abbreviation in thought.

2. A syllogism often contains four or more terms, when, for instance, a term is repeated in the form of its contradictory.

3. There may be a syllogistic form, and yet the criticism of the inference does not turn upon the rules concerning distribution of terms.

4. A formal criticism is often to be supplemented by material considerations. In actual inference the procedure is more direct and simpler than the formal syllogistic criticism. It retains the essentials of syllogistic inference, namely, an identical point of reference and a universal relation, and yet it need not give formal expression to them. This simpler method consists in a direct reference of the inferred element to its appropriate place in the system of knowledge by virtue of the canon of congruity, *i. e.*, that every inferred element must be congruent with the particular system to which it belongs and incongruent to all others.

There may be three modes of inference:

1. Given a subject, we infer its marks. This is the logic of analysis.

2. Given marks, we infer their appropriate subject. This is the logic of identification.

3. Given certain marks of a subject, we infer other marks necessarily growing out of the given. This is the logic of elaboration.

In all these forms the inferred elements are directly referred to their proper place in a particular system. The procedure is not from the known to the unknown; it is rather a revelation of that which is contained within the known, and enveloped by it. Some practical canons to guide in inference:

1. When, in a judgment expressed in propositional form, the predicate is *a* mark but not *the* exclusive mark of the subject, then the subject always implies predicate, but the predicate does not necessitate the subject.

2. When the predicate is an accidental mark of the subject, then no inference is possible.

3. When the predicate is recognized as the distinctive mark of the subject, then, given either subject or predicate, the other is implied necessarily.

Our practical inferences run along some such lines as above indicated. From a knowledge of the subject-predicate relations inference is simple and direct.

Elements of Consciousness. By MARY WHITON CALKINS.

This paper considered the principles of classification of elements of consciousness, conceived as absolutely unanalyzable. The author recognized three groups of such elements: (1) Sensational (or 'substantive') elements; (2) 'attributive' elements (including the affections 'pleasantness' and 'unpleasantness' and the 'feeling of realness' unless this last be a complex); (3) 'transitional' elements, such as the consciousness of 'oneness' and of 'manyness.'

Two portions only of the paper were read. The first of these proposed as a distinction between sensational qualities and sensational intensities the difference between simple qualitative series, like red, yellow, green, blue, in which the increase is of the *difference*, not of the sensational quality, and intensity series, like loud, more loud, still more loud, in which the increase is of the sensational intensity itself.

The second extract from the paper argued for the right of 'transitional' experiences to a place in any enumeration of psychic elements, on the ground that we habitually have experiences, like those of familiarity or of similarity, which simply are not reducible to complexes of sensation and affection. In anticipation of objections from both schools of psychology, it was insisted, on the one hand, that these 'transitional' elements are actual experiences, not logical categories; and, on the other hand, that the method of assuming contents of consciousness, without explicit reference to self-conscious selves, and of analyzing these contents into their elements, though not the only psychological method, is nevertheless an inclusive one, as applicable to what is called 'thought' as to 'perception,' so that the 'transitional' elements are as certain as the 'sensational' ones.

Nature and Choice. By EDGAR A. SINGER, JR.

The history of this problem reveals a certain change of attitude. From the primitive mind that finds nature full of caprice,

but sees its world in only one way, we pass to a science that strives to present nature in a 'single-valued function,' but recognizes the part played by the point of view in imposing such an interpretation on the facts. The one looks for choice within the world described and finds it in instances of lawlessness. The other looks for choice in the function of description and finds it in the formulation of law.

The paper proceeded along historical lines to show that science recognized a truth in its descriptive formulæ that was not merely conformity to fact. In its classifications and its choice of axioms it performed a function that was not uniquely determined by the facts described. But this choice, though not eliminated by observation, is not caprice. It must be exercised in a way that is determined by the meaning of 'experience' itself. To derive this principle of choice is to perform the old Kantian problem of 'deduction.' But whereas Kant arrived at the 'unity of apperception' as the contribution of the describer to the product we call experience, the post-Kantian thought has taught us to view experience in a more dynamic way. The thought's struggle after maximum unity might better represent the function which, from a study of the history of science, we should be led to regard as the describer's contribution. The liberty that the individual might enjoy to give up this struggle was not denied; but it was urged that experience was essentially a social product, and it was as a social, not as an individual function, that this principle was necessary to the meaning of a descriptive experience.

Methodology and Truth. By J. E. CREIGHTON.

The Spiritual Principle in T. H. Green's Philosophy. By E. B. MCGILVARY.

Green's whole procedure turns upon the assumption that consciousness cannot be developed by a process of nature. This would be true only if the natural process were a *mere* series, or if development demanded an abstract sameness through all its stages. Neither condition can be granted. Green's argument to prove that consciousness cannot result from change

rests upon the ambiguity of the word 'present.' Another fallacy is that of abstracting the object of *our* temporal consciousness from our consciousness, and then putting it in organic relation with an *eternal* consciousness.

The idea of eternity, however, cannot be dispensed with; but it needs to be redefined. We cannot follow Green in interpreting it as everlasting unchangingness through time. Eternity is transcendence of time, and there are three different ways in which time is transcended: 1. The organic totality of the universe, though a totality of parts in time, is not itself in time, inasmuch as it is neither before, nor after, nor simultaneous with, anything outside itself. This transcendence of time by the whole time-order is eternity. 2. Every time element in this order, though having a definite temporal position, has an influence over every other element at every other time, and this dynamic transcendence of time is eternity. 3. Knowledge, though an act in time, is not confined to its own time, in that it can present to itself the past and the future. This epistemological transcendence of time is eternity. These three eternities are organically related.

The Relation between the Natural Order and the Moral Order of the Universe. By DAVID IRONS.

Moral obligation is the form in which law appears in self-conscious beings who are no mere spectators of cosmic forces, but conscious combatants in the struggle. The law is internal; what it demands is felt as something we owe to ourselves. But while it is not an external force compelling us to act in one definite way, it is none the less inflexible. We must adopt a certain mode of behavior or be unworthy in our own eyes. From this alternative there is no escape. What we feel we owe to ourselves cannot be separated from our nature or from the circumstances in which we are placed. The content of the moral law in any particular case is determined by the nature of the individual and of his environment, *i. e.*, by the individual's place in the system of things. Hence, so far as it is realized, the moral order cannot be at variance with the natural or cosmic order, since its relation depends upon the fact that each individ-

ual performs his proper function. Immorality, departure from the moral order, is the only thing at variance with the order of the universe.

The Development of Content in Moral Judgments. By ELLEN BLISS TALBOT.

Moral judgment, according to Simmel's conception of it, has two elements, the matter (the idea of some particular action) and the form (the feeling of Ought). From the observed fact that the moral judgments of various ages and races differ so widely, Simmel infers that the Ought has no special content of its own, but can attach equally well to the ideas of all sorts of actions. It is not possible to disprove this theory of Simmel's, but it may be shown that another position is tenable. Simmel conceives human consciousness as a merely artificial union of form and content. In this respect he resembles Kant. Fichte and Hegel differ from Kant in regarding consciousness as a self-developing form, in which the content, at first implicit, is gradually becoming more explicit. If we view experience in this way, we shall explain the heterogeneity of moral judgments, not by saying that the Good is mere empty form, but by supposing that its content is not yet sufficiently explicated to be perfectly understood. This theory involves the doctrine that so long as there is moral progress, the nature of the Good cannot be fully known. On this view, the great diversity in ethical theories is easily explained.

The Relation of Ethics to Religion. By WALTER GOODNOW EVERETT.

The purpose of the paper is to inquire how the relation of ethics to religion must be conceived by one who seeks to subject the phenomena of man's moral life to scientific treatment. A distinction must, therefore, be made between the historical and the logical, the practical and the theoretical point of view.

1. It is necessary first to determine the generic character of the two classes of phenomena. Religion involves belief in a higher power or powers, in a transcendent being or beings, and also some form of cult or worship. Morality has to do with man in personal and social relations.

Religion and morality may also be distinguished as regards their source in man's nature. Religion has its source primarily in the relations which man sustains to nature, morality in the relations which he sustains to his fellows.

2. Religion and morality act and react upon each other. The moral attributes of deity are drawn from the ethical ideals of the chief worshippers. Man has projected upon the Infinite Spirit the highest excellence he has known. The ethical content of religion is due to an immanent, not a transcendent process of development.

3. Since almost every religion has taken up into itself some more or less detailed code of morals which it has imposed as matter of religious obligation, it is important to distinguish between a theological and a scientific system of ethics. The one rests upon religious presuppositions; its requirements are commands of the deity, its sanctions rest in his will. The other deals with discoverable facts of the present order, and its sanctions are found in the inescapable consequences of right and wrong conduct. But a metaphysic, a philosophy, of conduct, as distinguished from such a science, leads to the deepest problems of religion.

4. Three moments in the evolution of religion may be distinguished: (1) a stage of magic and sacrificial rites; (2) a stage at which creed and dogma are emphasized; (3) a stage at which the emphasis is shifted to morality. In a profoundly ethical religion like Christianity there result a unification and a harmony of the religious and moral life. Morality is warmed and brightened by faith in an Infinite Spirit, the creator and guarantor of the moral order.

5. In attempting to establish theoretically a religious view of the world one must proceed from the known to the unknown. Here ethics as a part of the known order comes first. How shall I interpret the world? By what it does. What then shall I think of a world-order which has unceasingly developed morality, has made it more and more regnant? Can I interpret it otherwise than in terms of reason and goodness?

6. If the value of religion has been found more and more in its ethical content, will not it be merged in morality and the

specifically religious cease to exist? In answer it may be said that religion has roots in man's nature independent of morality. Man will not cease to be religious and metaphysical. "We still recognize our absolute dependence upon the power that brought us hither and will conduct us hence."

The Contents of Religious Consciousness. By J. H. LEUBA.

Causes of Scepticism. By E. H. SNEATH.

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THE CRITERION OF SENSATION.

BY PROFESSOR GEORGE STUART FULLERTON,

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In a paper read a few years ago¹ before this Association, I tried to show that psychology, as a natural science, rests upon the same general assumptions as the other natural sciences, and that, however accurately it may describe the contents of consciousness, it nevertheless views the mind and the world from a standpoint which does not differ greatly from that which characterizes the thought of the unscientific. I pointed out, however, that the very clearness and thoroughness with which the psychologist deals with his subject throws into relief what seems a fatal inconsistency in the very foundations of the doctrine regarding the knowing mind and its relation to the world held by the plain man and the psychologist in common, while the vagueness of the thought and speech of common life serves to conceal, to some degree, this same inconsistency. I allude, of course, to the doctrine of representative perception, which distinguishes between things and our ideas of things, regards the former as causes² of the latter, and teaches that a mind can know directly only so much of things as is included in the representatives of them which are immediately present to it, and can reach only by inference whatever may be supposed to lie beyond.

It was shown in the paper to which I refer, that the inconsistency in question is imbedded in the very nature of the doctrine. The mind is completely cut off from external things, which it is supposed to know exclusively through their proxies; and yet the whole scheme of representative ideas and things represented by them is built up by tacitly assuming that it is pos-

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² I do not insist upon the word 'cause'; it does not concern this paper to discuss the point.

sible to know certain external things at first hand, to perceive the true relations of ideas and things, to compare copies with originals, and to trace the construction of a successful copy in detail, thus following step by step the development of the idea of an external world in this mind or in that. A flatter contradiction than this it is impossible to conceive. It is ideally flat. And yet it was maintained that this inconsistency in the psychological way of viewing the mind and the world need not diminish the value of the work done by the psychologist, that he may with profit continue to study mental phenomena in his own way, and that he may leave the whole problem of the elimination of this contradiction to someone else. This someone else is the epistemologist, whose business it is to work beneath the plane of the common understanding, and to analyze and explain concepts which those who remain upon that plane may very well use without analyzing them.

This view of the work of the psychologist, and of its relation to that of the epistemologist, I wish now to illustrate by a brief discussion of the question: What is a sensation? I shall try to show that any answer to this question, that can be given by psychology as natural science, cannot be regarded as ultimate except for convenience of discussion within a given field of investigation; that the justification of the answer given must be sought in the domain cultivated by the epistemologist; and that the contradiction which has been shown to exist in the psychological standpoint is innocuous simply because it is a contradiction only to the psychologist, and not to one who carefully analyzes his conceptions and comprehends clearly the use which he actually makes of them. What I have to say is neither very recondite nor very original, but it seems to me worth while to say it, nevertheless.

The importance of the part played by sensations in the doctrines of the psychologist can scarcely be overestimated. From them he sets out, and to them he finally returns. Upon them he bases, directly or indirectly, everything else that enters into his calculations—percepts, memories, the most abstruse and abstract chains of reasoning, the loftiest and least material of ideals. Sensations ultimately furnish the material for the construction of

his whole edifice, and at the same time they give to it whatever of stability and reality it may possess. For it is in sensation, and in sensation alone, as it is assumed, that the mind has direct contact of any sort with an external real world, receives messages from it, and can know that it is reacting upon it and playing a real part in a real system of things. When we leave sensations, and deal with those ghosts of them that Hume called 'ideas,' we leap into the air, and our leap is worth making only because we can again return to sensations, and once more plant our feet upon the solid ground. If such be the importance of sensations to our psychology, it is surely desirable to know with some clearness what a sensation is, and to be able to furnish some criterion by which it can be recognized to be such. What criterion shall we assume?

There are those who are inclined openly to justify the tacit assumption made by the psychologist that he actually perceives immediately external things, and who deny his formal statement that such are known only through their representatives in consciousness. They hold, in effect, that we immediately know both things and the mental complexes which stand for things, and that, being conscious of both, we are in a position to compare them with each other, and to pick out those ideas which really correspond to things from those that do not. This appears to furnish us with a very short and easy method of distinguishing sensations from other mental experiences.

But this denial of the doctrine of representative perception throws into the direst confusion the whole account given by the psychologist of the sense-organs and their functions, and makes incomprehensible his doctrine of the gradual emergence in an individual consciousness of the idea of an external world of things. If our knowledge of things is in any sense independent of the percepts which have been built up out of the messages conveyed to the brain along the sensory nerves—if the things themselves can be directly known by the mind 'alongside' of the percepts, there seems no reason at all why our knowledge of things should be a function of our percepts, and the exactitude of that knowledge in any way conditioned by the number and character of the percepts which we have, at any given time,

succeeded in building up. Why should not an infant, at the very outset of its career, before it has any percepts at all, nevertheless know real things just as they are and in all their complexity? It is by no means evident that percepts, sensations, brain, nerves, and peripheral sense-organs are at all essential to that immediate knowledge of things which is independent of their representatives in consciousness. The progressive development of a consciousness of things is an explicable fact upon the basis of the psychological principles generally accepted. It is a wholly bewildering fact upon the hypothesis that things are immediately present to the knowing mind *beside* the percepts which are supposed to correspond to them. On this supposition how is it possible for any mind, at any stage of its existence, to be ignorant either of the existence of objects or of their precise character? Are we to explain such ignorance by assuming that these objects, which are thus immediately present to the mind, keep changing to keep pace with the development of their mental representatives? This seems absurd. Yet if an object be present from the first as it really is, I cannot see that it matters at all what degree of imperfection there may be in those transcripts of external things which we call percepts. The mind may conceivably know things just as they are, however inadequate the images of things which it has succeeded in building up, or, for that matter, whether it has built up a store of such images, or has not yet begun to do so.

Well may the psychologist beg to be delivered from the friendly offices of those who would defend him, if his defense is to be undertaken in this outrageous fashion! His tacit assumption that he directly perceives the world of material things and knows immediately that he is dealing with such when he is observing or experimenting upon a human body, was, after all, only a tacit assumption; it was smuggled in quietly and was never intended to be applied recklessly, *semper ubique et ab omnibus*. He may assume that *he* directly perceives the body of his subject and the visible object toward which its eyes are turned. But he stoutly denies that *that subject* sees this external object, except in the sense that, as the result of a certain physical action upon his body and the subsequent nervous re-

action, there arises in his mind an image or representative of it. The image is allowed the subject; the thing itself is denied him. It is strenuously maintained that whatever may be the properties of this outer thing, they are as nothing to the subject unless they are reproduced in that image. The whole domain of the psychologist appears to be devastated if this, his fundamental assumption, be denied.

It seems almost unnecessary to discuss at length this preposterous doctrine of an immediate knowledge of things external independent of the percepts which represent things. Yet the doctrine has been seriously advanced again and again, and in a variety of forms. Sometimes it is advanced in so vague and insidious a form that its full significance is not easily grasped, nor is its absurdity clearly apparent. We are asked to believe, for example, not that the mind knows *things* independently of its percepts, things with the definite properties that make them what they are, but that it knows *reality*. Why it should thus know the something called 'reality' rather than the definite forms of real being which things seem to us to be is never made apparent. If we can know anything except *in* or *through* (*i. e.*, by an inference from) our mental representatives of things, there seems no reason why we should not thus know everything, and our whole circle of percepts becomes a mere epi-phenomenon, a useless thing, valueless baggage with which the psychologist bustles about to no purpose. Well may the psychologist stand aghast at the logical implications of this doctrine brought forward in his defense.

It seems, therefore, both wise and charitable to allow the psychologist to persist in his denial that we know directly anything beyond the mental complexes which he endeavors to analyze and classify; and, in that case, we must not expect him to distinguish between sensations and other mental experiences by the simple expedient of picking out those experiences that can be immediately perceived to correspond to external things or to aspects of such things. To what criterion shall he turn?

There is, of course, the greater degree of vividness which serves to mark out roughly our sensations, as a class, from what Hume calls our 'ideas.' But it is impossible to overlook the

fact that this difference in vividness is by no means an infallible criterion, and that, consequently, some other must be found if we are to feel quite safe in relegating a given experience to the one class or to the other. A psychologist will note the fact that our sensations are usually more vivid than their copies in memory and imagination, and he may point out the truth that this fact is of much importance in practical life; but no psychologist would dare to make the vividness of a given experience the sole basis of its claim to being a sensation. Hume's 'ideas' may, in certain cases, be very vivid and insistent; sensations may be extremely dim and shadowy. The inarticulate murmurs with which the body protests against impure air or ill-fitting clothing we recognize as sensations, while we banish to a different class the most impressive of hallucinations and the most distinct of figures seen in a dream.

We must, then, discover some other final court of appeal, if the claims of sensations and 'ideas' are to be determined with anything like an approach to justice. Such a court the psychologist tries to furnish us in distinguishing between mental experiences which are to be regarded as the result of a 'peripheral' stimulation, that is, those which come into being when the outworks, so to speak, of our nervous system are thrown into a state of activity; and mental experiences which correspond to a relatively independent activity of the 'central' nervous system, those, in other words, which represent brain action which is not a direct response to a message conducted along a sensory nerve. The distinction appears, at first glance, to be a convenient one. Perhaps it will really be a very convenient one when we possess a more accurate knowledge than we now do of what takes place in the peripheral nervous system and in the central under such and such circumstances.

But what is meant by this appeal to the peripheral nervous system? If the psychologist assumes that he knows an external body with its nervous system independently of the whole circle of his sensations and 'ideas,' he involves himself, as we have seen, in no end of trouble. To save him from this, we must do him the credit of believing that, whatever be his modes of expression, and whatever the vagueness of his thought, he does

not really mean this, or at least does not depend upon such an assumption, but adheres to his doctrine of representative perception. When, therefore, he tacitly assumes that he knows his own body and certain other bodies immediately, we must understand him as having reference to certain complexes of sensations and 'ideas' which he recognizes under those names. At once the question arises: How can he prove these experiences, which are to furnish the touchstone for judging other experiences, to be of the class called sensational? to be composed, in part, at least, of sensations? If he simply assumes that they are such, as he apparently does, and then uses them as a test of other experiences, is he not, in his whole investigation, simply guessing at half the distance to the sun, and then multiplying by two, in order to discover how far away the sun really is? And what becomes of the doctrine of representative perception itself, if it is quite impossible to prove satisfactorily that certain complexes in our consciousness really represent external things, and if this has to be arbitrarily assumed at the outset. The psychologist appears to be forced to choose from a pair of dismal alternatives: either the mind *is not* shut up to the circle of its sensations and 'ideas,' with what may be constructed out of these, and then the house of the psychologist rests upon sand that will not bear the test even of dry weather; or the mind *is* shut up to the circle of its sensations and 'ideas,' and then it is only by making a quite arbitrary assumption that the psychologist can gain a criterion which will enable him to distinguish between sensations and their copies, and to affirm that now his experiences represent real things and now they do not.

The position of the psychologist is not, however, so bad as it looks when set forth in this way. The assumption that external things can be known independently of percepts is, to be sure, really fatal to psychological doctrine, and can be seen to be so by anyone who will patiently develop the consequences of the assumption. But, for the other alternative, does it really follow that, if we accept seriously the psychological doctrine that a man is ultimately shut up to the circle of his ideas (here taking the word in its broad sense), it is impossible for him to arrive at a knowledge of real things, and to distinguish between

sensations and mere copies of such? Is the psychologist's assumption one for which no reason can be given?

I have maintained that the psychologist remains upon the plane of the common understanding, and assumes that he has a right to assume certain things even if just what is implied in these assumptions is not fully understood. This does not necessarily mean that such assumptions are made arbitrarily. It only means that he does not, as a psychologist, feel called upon to prove his right to make them. When we set ourselves to work to examine them systematically, we may find that he was perfectly justified in making them, and that he did so because he found in his experience abundant reasons for so doing; but we may also find that he was but dimly conscious of these reasons, and that he is in some danger of misunderstanding the actual significance of the assumptions that he has made. We have seen that the psychologist assumes that he is assured of the reality of an external world of things in which human bodies play a part, and that he appeals to this in his endeavor to furnish a criterion of sensation. We have seen, further, that if we try to justify this assumption in one way, we simply undermine the foundations of psychological doctrine. And yet there must be some way in which it can be justified; psychology does rest upon this assumption, it is a science, and it does prosper. It cannot be either wholly baseless or hopelessly inconsistent. The psychologist may not feel called upon to look into all this, but, in the interest of clear thinking and accurate knowledge, it is surely desirable that some one should do so.

Now what sort of evidence is it that has led the psychologist to assume that he has a touch-stone by which he can distinguish sensations? He has had a life-long experience of the fact that his experiences fall into two classes, marked by differences in the way in which the experiences behave, by differences in the order of their appearances and disappearances. The child is quite capable of recognizing that the lion which appears when the blankets have been tucked in, and he has been abandoned to the phantom terrors of a solitary crib, is not exactly like the lion that exhibits himself by day in a cage, and which can be seen only by paying admission. The behavior of this lion is

too inconsequent. He is real enough to inspire fear, but he is, nevertheless, not exactly real. The presence of the light is enough to exorcise him. And even the man who has no settled opinions touching the existence and nature of ghosts is apt to think that the ghost that can be photographed is more real a ghost than the one which can, at best, only make itself apparent to the terrified rustic at dead of night. We have all our lives been judging our experiences, and arranging them as a result of that instinctive judgment. What we see we try to touch, and what we touch we perhaps try to taste and smell. When such direct tests are out of the question, we can apply, as we learned long ago, certain indirect tests that may be regarded as their equivalent. But tests of some sort we must and do apply, and we have been applying them with a good deal of success, and with, hence, an unshaken confidence in their validity, during all the years over which memory extends. No one approaches mature life without finding himself in a world of things pretty well known, and without settled habits of testing things to find out whether they are *real*, *i. e.*, whether they belong to that orderly class of experiences which have fallen into a connected system, or whether they defy such an arrangement and must be relegated to a class of a different kind.

Hence it does not occur to the plain man to offer proof that his body is real and that it is rather intimately connected with the knowledge of other things. He knows that it is real. It is an old friend, whose stability of character cannot be brought into doubt by the officious questions of the irresponsible sceptic. And as to the part it plays in the knowledge of other things, a man has not arrived at years of discretion who does not know that when he shuts his eyes things are, for him, snuffed out; and that when he sticks his fingers into his ears, the sounds he has been hearing give place to silence. All these things are experiences which have been found to fall into a fixed and orderly system. That system is for him the system of real things. His body and certain other bodies evidently belong to it, their reality does not have to be proved, and he only busies himself to prove the reality of those things that are still in doubt. He may raise the question whether what seems to be a human body

faintly and vaguely perceived is really a human body or a delusive appearance, but he does not raise the question of the reality of the eyes with which he is looking.

Thus the plain man finds himself in a real world of things at the outset of any given investigation. He endeavors to extend his knowledge, but he sees no necessity of trying to prove that, as far as it goes, it really is knowledge. Before he recognized with even an approach to clearness that his experience presents him with 'ideas,' which should be carefully distinguished from things, and which sometimes pass themselves off for things in a conscienceless way, he felt himself to be in a world of things, real, insistent, unmistakable, and, at least to some extent, law-abiding. It seems to him simply absurd to say that perhaps he is not really conscious of a world of things at all, but is wholly shut up to a world of mere copies and appearances.

And the psychologist is evidently in the same case. He emphasizes, it is true, the distinction between things and their mental representatives, and boldly puts forward the doctrine of representative perception; but, as we have seen, he always tacitly assumes, nevertheless, that he is in a world of real things, is conscious of such things, and can use this knowledge as a basis of his reasonings. His criterion of sensation, the reference to the peripheral nervous system, is merely a refinement of the unconsciously assumed criterion of the plain man, and it is, moreover, a refinement of which, in the present state of our knowledge, we can make but a limited use. What psychologist would dare, on a bare inspection of some part of the peripheral nervous system, to declare that a given individual is experiencing a sensation? He moves a light before his subject's eyes; there is a certain reaction; he infers the presence of a sensation; he leads the subject to believe that a faint light will be presented; he does not present the light; there is the same reaction; he infers that the subject has mistaken an 'idea' for a sensation. In all this he reasons just as the plain man reasons, and if he afterwards talks of peripheral and central nervous activities, it is not because an immediate perception of these has furnished the basis for the conclusions at which he has arrived. Even if—a consummation

devoutly to be hoped for—we some day succeed in attaining to such an acquaintance with the nervous system as will make possible an accurate knowledge of its reactions, in part, at least, at first hand, we shall still find the psychologist doing substantially what is done by the plain man, when he tries to discover whether a given experience is sensational or imaginary; we shall find him trying to fix its relation to a certain mass of experiences already recognized as real. We shall find him referring it to a world of things, a world which, as he cannot doubt, is given in his experience. The fact that he can proceed rather mechanically, by the application, as it were, of a convenient formula, merely signifies that he can do his work without being compelled to have recourse to that which gives his formula its significance.

Here it will be objected that I seem to be slurring over the distinction between things and their mental representatives, a distinction which is nevertheless recognized both by the plain man and the psychologist. If I describe the process by which a man arrives at a consciousness of a world of things as nothing more than the recognition of the fact that certain of the elements in consciousness fall into a certain orderly system; if I conclude that any element must be assigned a place in the real world, or refused such a place, not by virtue of some inherent peculiarity of its own, but by virtue of the peculiar nature of its relation to our other experiences; if, in short, I refuse to admit a world of things quite beyond and numerically distinct from the whole circle of our sensations and 'ideas,' but somehow include in consciousness things 'outer' as well as things 'inner,' then am I not contradicting both the plain man and the psychologist, who certainly appear to believe that they find themselves in a real world of things quite distinct and different from consciousness-contents of any sort? When these men speak of the body, do they not mean something quite distinct from all experiences of the body?

To this I must answer, it is rather a nice question to determine what a man means when he does not know what he means himself. The plain man evidently has the vaguest possible notion of what he means by external things, and of the significance of the

distinction between such things and their mental representatives. And although the psychologist brings this distinction into sharper relief, he does not even attempt to answer the questions to which it so naturally gives rise. Our psychologies do not begin with definitions of reality, or investigations into the possibility of representing real things by means of mental complexes. They assume that we all have that somewhat indefinite knowledge of things which belongs to common life, and they begin building upon that basis. Hence the epistemologist need not feel that he is opposing the plain man and the psychologist, when he refuses to accept certain of their statements regarding their position. He may claim that in making such statements, these men have wandered away from their own field; that they have become, for the moment, epistemologists. He knows well that those who are epistemologists only for the moment and as the fit seizes them, who have given no serious and continuous thought to the problems with which epistemology deals, may easily misconceive the significance of the concepts which they undertake to analyze.

I do not wish to terrify this Association by leading it to suppose even for a moment that I intend to expound in detail in this paper just what the epistemologist means by the external world and its representation in an individual consciousness. It would require a lengthy discussion to do justice to this theme. But I hope enough has been said to make it seem not altogether unreasonable for the epistemologist to take at least the following positions:

(1) The psychologist is not wrong in assuming that he has an immediate knowledge of the real world of things, and he is justified in working upon this basis.

(2) Nor is he wrong in distinguishing between things and the complexes in consciousness which stand for them—between things and, using the word in a broad sense, ideas of things. The doctrine of representative perception has not been framed arbitrarily, as its usefulness to the psychologist abundantly proves.

(3) It will not do to eliminate the contradiction in the psychologist's assumption that he does and at the same time does

not immediately perceive real things, by denying the doctrine of representative perception. This can only result in hopeless confusion.

(4) The contradiction can only be eliminated by recognizing the fact that percept and thing perceived are not two things numerically distinct and outside of each other, but are two ways of regarding the same complex in consciousness. The distinction between complexes in consciousness and the real things for which they stand is, hence, a distinction within consciousness; and it is not pure dogmatism, such a dogmatism as the metaphysician is sometimes accused of, to speak of the relations between the inner and the outer worlds.

(5) But the elimination of the contradiction in the psychological standpoint is the duty of the epistemologist, not that of the psychologist. For the latter, the distinction between things and percepts is unanalyzable. To see its true significance one must leave the plane of the common understanding, which means that one must leave the plane of natural science. And since the psychologist, in offering us the criterion of sensation which he does offer us, makes use of this distinction without attempting to analyze it, his criterion is, as has been maintained, ultimate only to those who remain within a certain field. He bases himself upon experience, it is true; if he did not, his work would be valueless. But he does not furnish us with an analysis of the experience upon which he takes his stand. It is not necessary to his purpose that he should do so.

DISCUSSION AND REPORTS.

PHYSICAL PSYCHOLOGY.¹

A few years ago I heard a paper on an old subject, 'The New Psychology,' that was amusing for several reasons, but for nothing more so than the classification with which it opened. Like Gaul of long ago, psychology was divided into three parts: rational psychology, experimental psychology and biblical psychology. Now, however, outdoing that modern Cæsar, I would—and possibly not less to your amusement—add a fourth province to the list, namely, physical psychology. Physical psychology is concerned with the substitutes or indirections for mind that appear in all the so-called physical sciences, in chemistry, physics and mathematics. It is, of course, quite unconscious of itself as psychology until it has been exposed, being at least one degree more remote or indirect and objective than physiological psychology, but its unconsciousness and remoteness can not make it less interesting or less serviceable to a sober student of mind.

Of the abstractions or indirections for mind in the physical sciences I made mention in a paper before the American Psychological Association in 1897.² The general principle upon which I relied at that time was that psychological or epistemological sciences and physical sciences, which assume the dualism of mind and matter and are accordingly separated from each other, must reproduce, as if by projection on their own planes or within their own peculiar spheres, the same dualism,³ or more generally and with a possible suspicion of Hegelianism, the terms of any antithesis, opposites of any kind, do and must individually reproduce their opposition, and this the more if the opposition is absolute. Indeed, since opposition means difference, things that are different in any degree must one and all *individually* reproduce the whole system of differences to which they belong.

¹ This paper was read by title before the American Psychological Association at the New Haven meeting in December, 1899.

² See *Philosophical Review*, July, 1898: 'Epistemology and Physical Science—A Fatal Parallelism.'

³ For example, the atoms and conserved matter of chemistry, the things that move and motionless transmitting medium of physics, the finite quantities and infinity of mathematics, and the sensations and thought or apperception of psychology.

Put in this way, the principle is seen not merely as an exposure of dualism, but also as an account of all differentiation. Any individual, for example, is made a whole-containing part, a microcosm, and its life-history, not literally perhaps, but still in a sense also thoroughly genuine, recapitulates its entire development. But this more comprehensive application of the principle of difference or opposition is not a part of my present purpose, although the mention of it has seemed to me to be serviceable. As already implied, I wish to consider only the special case of dualism and particularly the transformation or exposure of physical science that the principle effects.

That opposites do reproduce each other or take sides with each other, being each invisibly what the other is visibly or intensively what the other is extensively, may require no more than statement, but still I would suggest as illustrations such opposites as good and evil, religion and science, organic and inorganic, conservatism and radicalism, spiritual will and physical force, the one and the many, idealism and materialism. In each of these cases either of the opposed factors is hidden or implicit in the others. Virtue as only the negation of vice is always a party to vice. Unity, that is an abstraction from plurality, is empty and so, although perhaps extensively one, is many intensively, and plurality, that is an abstraction from unity is still intensively one, being plural only by reason of what can be but indifferent differences. In the early Greek philosophy, because Being and not-Being, the One and the Many, individually reproduced their opposition, Heraclitus was able to identify them in Becoming. And the regularity with which in ancient or in modern philosophy materialism and idealism have passed into each other and even through each other is well known.

But physical psychology can justify its claim to recognition in other ways. An abstract principle that in spite of profuse illustration the timid among thinkers may find offensive for being paradoxical, is not its only witness. The early Greek philosophy is now very generally recognized to have been busied with physical abstractions for mind. Thus Anaximander's Boundless, the Eleatics' Being, Heraclitus' Fire or Becoming, the Number of the Pythagoreans, Anaxagoras' Nous and Democritus' Vacuum were all concepts of a physical psychology. No mere accident made the Vacuum of Democritus and the Concept of Socrates contemporary developments in the history of philosophy. And then, as if by what a biologist might call the present's recapitulation of the early Greek philosophy, our modern physical science is busied also with mind under physical disguises. Conservation as a

doctrine of constant amount, infinity as a quantity, physical plenitude as meaning that what is between things is as real as the things themselves and motion as defined by Newton's laws, or in any other way that would judge it extensively, only are each and all of them abstractions for mind. This is to say that in them all we can discover, we can unmask the essential character of mind; and no wonder, for are they not all openly treacherous to the categories of matter or of physical reality generally, being in meaning and use, when not also in form, veritable negations of matter within its own camp? The books of the day¹ that more or less clearly recognize these treacherous negations are actually rivaling the historical novels in number.

No scientist at the present time would hold that conservation is of a finite quantity, whether of matter or mass or energy or anything else you like, and yet the only quantities are finite quantities. Infinity, to which conservation is applied, is not a quantity, being an open denial of the very limitations that make quantity. Conservation, then, instead of referring to mere quantitative constancy, may even be a principle of quantitative change. What it does assert is just such unity and indivisibility in the world as makes the discovery of law possible, for without conservation mind, which is also one and indivisible, could not find itself reflected in the physical world. Indeed it seems no extravagance to me to say that conservation, however physical in its standpoint, is only an indirection for self-consciousness or at least for what Kant has called the unity of apperception. By its assertion of the constancy of a quantity that is infinite it unwittingly makes the physical world participate in the nature and specifically in the unity of mind.

In regard to infinity some may hold that it is a quantity, but, if it is, then all quantity must be more than mere extension, infinity being only a witness to the intension of quantity in general. Thus, on the assumption of infinite divisibility space and time have parts that are coextensive and contemporary respectively, and this is but to make them virtually indivisible and to give them a unity of intension, which is, again, the very unity that we commonly ascribe to mind. Mind or thought might even be defined as that in which the parts of space are made coextensive—or mutually inclusive—and those of time contemporary. Such coextension or contemporaneity of parts is, of course, paradoxical, but the conception of it is as legitimate as infinity and the paradox only shows how thought can transcend its forms.² More-

¹ Ward's 'Naturalism and Agnosticism' is a noteworthy example.

² Mathematics has many illustrations of thought transcending its forms. Consider, for example, its use of surds, irrationals, imaginary quantities, incommensurables, and the like.

over, the familiar law of relativity, as a law of mental states, can mean no less than that the parts of experience in space or time are mutually inclusive, since it makes all experience one and indivisible.

But, thirdly, of a kind with conservation and infinity there is the conception of plenum. The plenum, relatively to what is in it, is a vacuum. The ultimate ether with all its ideal properties of impenetrability, rigidity and the rest is not only between all things, but also must permeate all things, and so being necessarily different in kind it can really be only an indirect representation of another sort of continuity than that of mere physical contiguity. An organism, for example, whose parts in a very genuine sense are actually coextensive and whose temporal stages, if there be any truth in recapitulation, are contemporary, is continuous in another way than that of contiguity, for mere contiguity is purely statical. This, too, is more than an illustration here, for at the present time both chemistry and physics seem to be preparing for the admission of organic evolution to their sacred precincts; in short, to be near to an identification of material reality with the nature of organism. The continuity of organism, however, is quite consistent with the intensive unity of mind.

And, finally, intension is as much a truth of motion as extension. Newton really corrects the false standpoint of his laws by the provisos with which they close. Thus a body in motion continues to move only if not resisted, and a body at rest remains at rest only if not disturbed. Moreover, one can accept these laws, and many do accept them, and at the same time believe neither in the absolute rest nor in the absolute motion of anything. But were motion only extensive, such absolutes would be necessary; so that in denying them or in recognizing as universal the resistance of motion and the unrest of inertia the physicist is really admitting intension to his idea of motion. Motion has intension, if it is in an infinitely divisible space and time, whose parts, to repeat once more, are coextensive and contemporary, and this is to say if it is not the right and property of separate individuals, but the inner activity of an indivisible whole, being identical perhaps with organic interaction. So early a thinker as Zeno, the subtle logician of the Eleatics, was at best very near to recognizing the intension of motion when through the use of the idea of infinity he found rest to be one of the truths of motion. Neither rest nor motion, he seems to me to say, belongs to any individual thing peculiarly; the two are not mutually exclusive states; rather they are truths about each other, rest being the intension of motion. Zeno's paradoxes were only his way of saying, to quote from above, that

motion is but the inner activity of an indivisible whole and modern science, using the infinitesimal and through this able to describe motion in the laws or formulæ of a pure mechanics, is justifying him. The rest of motion makes a science of motion possible. To perception, then, motion may be only extensive, but to conception, to scientific formulation it is also intensive. The rest of motion is the unity of mind that all lawfulness reflects.

Of course, I shall be accused of trying to establish physical psychology upon the mystical ground of a vision of the invisible, but, to say the least, the accusation, if it come from physical scientists, is a most fatal boomerang, for what science, however objective, does not rely on a vision of the invisible? The intension or rest of motion, with which I would identify the unity of mind, may be quite beyond the possibilities of sensuous imagery, but what of that? Science has yet to dismiss from the respectable company of its conceptions the conception of the infinite, upon which this invisible rest of motion is established, and of all things infinity certainly outruns the imagination. Moreover, in this case as in so many cases, what we cannot find when we look for it, what we cannot consciously imagine or analytically construct is in fact actually and immediately present to us. Every physical quality, present to consciousness as sensation, is nothing more nor less than the rest or intension of motion. And then, furthermore, even an objective physical science, which would see everything in extension, is not wholly helpless, for it has its ways of escaping its limitations. Thus, to give a simple example, in rotation, so important to modern science, motion is shown to be intensive, for (1) it appears as responsible to its starting-point as to its goal, (2) it expresses a difference that is only in degree, (3) it is consistent with the principle of conservation, (4) it is rest as well as motion, and (5) it is a resultant of opposites. As only extensive, motion could be but sheer escape or sheer change of place, having no persisting responsibility to its starting point, and it would imply difference in kind and deny unity or conservation and be only so much lawless or brute momentum.

So, to summarize and conclude, the claims of physical psychology to recognition lie, first and most generally, in the fact that opposites must individually reproduce their opposition, a fact which forces into physical science certain abstractions or disguises for mind, and, secondly and specifically, in the witness that such abstractions as conservation and infinity and plenitude and motion bear to the presence of intension, of the unity and indivisibility of mind, in the physical

world. Physical science has long been fond of boasting a freedom from paradox and contradiction, resenting the subtle dialectics of philosophical inquiries, but if the thinking here be correct, the boast is a most hollow one. The hidden paradoxes of physics turn physics inside out, they turn it into psychology and philosophy.

Of course, physical psychology is something of a mongrel, but let me say that crossing the sciences is becoming a sign of true sportsmanship among scientists.

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PSYCHOLOGICAL LITERATURE.

Aberglaube und Zauberei von den ältesten Zeiten an bis in die Gegenwart. Von DR. ALFRED LEHMANN, Direktor des psychophysischen Laboratoriums an der Universität Kopenhagen. Deutsche autorisierte Ausgabe von DR. PETERSEN. Stuttgart, Ferdinand Enke. 1898. Pp. viii + 556.

For the student of culture and of the mental processes upon which culture depends, the story of human error and of misdirected effort is as instructive as the history of truth and of progressive achievement; for the tendencies which develop forms of belief are quite as characteristic psychologically, whether these beliefs survive the tests of a more advanced science or are weighed in the scales of a critical judgment and found wanting. Parallel with the evolution of scientific knowledge and of conceptions and principles, is an evolution of logic. A form of evidence or of argument which seemed formidable to the scientist of only a few generations ago may to-day seem trivial and irrelevant; and this partly because of the increased knowledge and new conceptions which explain the phenomenon in question in a different and more thorough manner, but also partly because our perspective of logical values has been notably modified by the inheritance of the ages. This contrast becomes all the more striking when we attempt to measure the thought of a remote age and of a different form of civilization by the standards of our own period. The scientific conceptions of Chaldean and Egyptian, of Greek and Roman, or of the mediæval scholar are so at variance both by what they lack and by what they present—by their standards of credibility and by their entire logical attitude—with those which we inhale in our mental atmosphere, as to require a considerable effort and, indeed, a special imaginative gift to bring about a sympathetic and appreciative comprehension of this ancient lore. The continuity of development, however, brings it about that beliefs once prevalent are but gradually superseded or discarded; they may disappear among the more cultivated, but culture, even to-day, affects only a moderate portion of the community. The conservatism of tradition is more potent than the advance of new truth. And, moreover, from time to time, the notions of a bygone age or of a

more primitive culture reappear, possibly in more modern garb but still recognizably the same, to find adherents among intellectual malcontents, who regard the dominant attitude on this or that topic unsatisfactory or false, and are desirous of replacing the slow methods of science by the more brilliant achievements of magic or inspiration. The existence in our midst of adherents of notions and systems which were dominant in a bygone age, the cropping out among us of movements the propagation of which proceeds by appeal to the same impulses and tendencies which pervaded the mystic lore of the past, make it more readily possible to understand the attitude of the original adherents of these beliefs.

Dr. Lehmann's work is a notable contribution to the psychology of human error; it is a valuable aid to the student who wishes to form an acquaintance with the pseudo-science and the primitive science of the past, and to appreciate the relations of antiquated lore to its modern survivals and revivals. It forms a thesaurus of such information and it reviews this information in a psychological light, which is at once clear and helpful, a light which is modern and critical and direct. Pseudo-science, the occult, human error, superstition—however we may term it—comprises the products of certain mental stages and tendencies; and these formulated products contribute the subject material of the volume. Dr. Lehmann calls it superstition and includes therewith magic, which he aptly characterizes as superstition reduced to practice. But these superstitions, though they may be but incidental in a later civilization, reflect the essential habits of thought of a less developed period. They constitute the replies to serious questionings and grave speculation. It may be 'Aberglaube' to us, but it is 'glaube' to its adherents; and therein lies its psychological as well as its historical significance. The field of inquiry thus suggested has not been frequently covered in a comprehensive and critical spirit; and of specifically psychological studies dominated by an appreciation of modern psychological conceptions there are almost none. For this reason the present volume is likely to occupy a prominent place as a guide and *vade mecum* for the student of this interesting field. It, therefore, seems proper to indicate the scope and general contents of the volume.

While the historical portion is considered as introductory to the account of modern 'superstitions' and the interpretation of the entire range of phenomena, it occupies a very considerable portion of the volume. After a brief review of magical practices amongst primitive peoples, the magic and superstition of Chaldea, of Greece and Rome,

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of the Jews and the early Christians, of Norse and Finns are presented in interesting outline. This lore is concerned, as it continues to be concerned almost up to our own day, with auguries and portents, with the treatment of disease, mainly by driving out demons and by exorcism, with influencing and predicting the future by astrology or clairvoyance or fortune-telling, by oracles and divination, and with the attempt to combine these various practices into a more or less consistent and comprehensive system—a system frequently involving conceptions of cosmogony and religion. The elaborate development of Chaldean magic, the indirect dependence of later occult lore upon it, the success of modern exploration and research in bringing to light these early records of human speculation, contribute to give the magic of Chaldea a fundamental historical position. In no other way can one be so impressed with the generic similarity of the psychological processes and ambitions that pervade this long record of human endeavor to pierce the mystery of existence and to steer one's craft by an occult compass, than by viewing the history of superstition and magic against the background furnished by the lore of Chaldea. A special interest also obtains to the cult of Norseman and Finn, because of the originality and relative independence of this development. The author's personal and local interest in these traditions is properly reflected in the more detailed delineation allotted to them.

The mediæval development of Christianity brought essentially new contributions to magical practices and to magical systems. The epidemics of witchcraft represent acute culminations of dominant beliefs; but these outbreaks are closely related to elaborate demonologies and various superstitious conceptions of God and nature. Dr. Lehmann devotes a special section to the occult 'sciences' which flourished so luxuriantly in the superstitious atmosphere of mediævalism. Astrology and alchemy, the Kabbalah and other forms of symbolic interpretation, the doctrine of sympathies and antipathies, the treatment of disease by methods founded on fanciful analogies, the search for the philosopher's stone and the elixir of life and the transmutation of metals, the speculations of an Agrippa or a Paracelsus—are replete with illustrations of the results of learned error, in the absence of a scientific logic and of the saving conceptions which such logic engenders. They furnish the text alike for logical and for psychological sermons and parables.

We must certainly modify the current associations of 'superstition and magic,' before we can include under this head modern spiritualism and theosophy and occultism and demonstrations of the

fourth dimension—at all events before we can do so without provoking a general alarm in many vigilant camps. In reading the volume one finds the transition easy and natural from mediæval demonology to modern spiritualism. In the accounts of critical investigations of 'spiritualistic' phenomena one encounters a logical attitude quite foreign to that of preceding ages; and the phenomena presented are unmistakably clothed in modern fashion. But the atmosphere of the séance chamber has a sympathetic suggestion of ancient magic, and the logical status of speculations about astral bodies and reincarnations is not altered when they are talked about in the language of the nineteenth century.

The last section of the volume represents the psychological portion. The dominant tone is explanatory. It considers the natural tendencies of mind favorable to the formation of 'superstitious' conceptions; by the aid of recent advances in the domain of psychology, it analyses the phenomena exhibited in the past. An account of normal errors of observation—as exemplified in the effects of interest and attention, of the success of a prestidigitateur or in the classic observations of Mr. Davey—furnish an illuminating though not a complete psychology of deception and prejudice and the propagation of contagion. The study of unconscious and involuntary movements, of dreams and somnambulism, of the varied phenomena of hypnotic suggestion, gives to accounts of possession and trance and religious ecstasy an intelligible interpretation. The scientific study of the action of drugs and particularly of the peculiar mental concomitants of hysterical and epileptic conditions, enables the modern student to detect in the distorted descriptions of fanatical witnesses a consistent illustration of mental disease. The most truly objective phenomena, the residue of fact, which under the potent superstitious conceptions swelled to an enormous body of belief—composite of tradition and ignorance, of an inflamed imagination and an ascetic theology, increasing by the momentum of personal feeling and popular unreason—thus become somewhat stripped of their mystery. Much remains to be accounted for, and the importance of the mental atmosphere in which alone superstition thrives is not to be lost sight of; but a review of these phenomena in the light of modern psychology enables one to see the character of the forest and prevents one's bewilderment by a mere aggregation of trees.

The intrinsic merits of the work are manifold, especially in contrast to other contributions to this field. The author's conception of his task is admirable, his industry untiring, his estimation of relative

values sound. The execution fails in more than one respect; there is little continuity of method in the historical portions; the reader feels that his attention is drawn hither and thither not for adequate reason, but rather by neglect of a finished composition. Useful as may be a reference handbook to the occult, a more organic treatise would be still more valuable. How discerningly the historical material has been collected must be left for the historical specialist to decide. Important omissions in the accounts of modern 'occult' movements will be noticed, particularly by the American reader. In the account of spiritualism the report of the Seybert Commission—which from the author's point of view is perhaps the most important contribution to the topic—is not mentioned. The account of unconscious movements would have been more forcible if it had been based on a more extensive knowledge of the literature. These defects of execution and detail should be stated, but they should not be allowed to interfere with the general favorable estimate of Dr. Lehmann's labors. Every psychologist who is interested in the relations of his science to the problems of the history of culture and of the development of rationality, is sure to find in this volume an almost indispensable aid.

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De la méthode dans la psychologie des sentiments. F. RAUH.
Paris, Alcan. 1899. Pp. 305.

The special theme of this volume is worked out with reference to its general bearing on the questions of psychological method. What makes psychology scientific? That, broadly stated, is the problem. And the answer given is, Not a particular method, but an attitude. The scientific attitude is characterized by submission to facts. A science is made up of facts and laws and of theories. But the theories here have relation only to prevision of facts or to coördination of the laws of prevision. In either case they are in close touch with experience. A scientific theory, therefore, is very different from a philosophical. The latter seeks to satisfy the demand for unity and system. The scientific spirit is opposed to the spirit of system in that it adapts itself to immediate experience. Judging by these tests, the author finds much in current psychology to criticise. It aims, he thinks, too directly at unity, and achieves an elegant schematism; it makes hasty generalizations and employs conceptions that are too abstract and simple; it relies too exclusively on particular methods, instead of freely using all methods, each in turn according to circumstances; it fails to

do justice to the variety and individuality of the particular instances and hence overlooks the necessity of constantly correcting by new experience the views, rather than theories, to which the spectacle of the mental life gives rise.

Illustrations for these criticisms are drawn in the first instance from assumptions of the physiological school. The author selects especially three: (1) it is wrong to speak of the reciprocal influence of the physical and the psychical—the psychophysical fact is indivisible; (2) psychological problems must be attacked from beneath, by advancing to the complex from the simple; and (3) the reflex act is the fundamental fact of the nervous system, and consequently of psychology. He tries to show that these assumptions are all scientifically worthless. He cites Richet, Binet and Ribot as abandoning the intransigent attitude of their earlier works, but the school, he says, has too long imagined that the business of the psychologist is to translate into the language of a hypothetical physiology the data of a commonplace observation. Similar onesidedness is found in the exaggerated importance attached to experimental psychology in the laboratory. The author notes two special dangers in this form of research, namely that its observations, if impersonal, are insignificant, while if they were personal and interesting, they are irremediably variable. He remarks too on the striking disproportion between the labor and ingenuity expended and the poverty of the results. He commends the method, but sees in it no ground for disparaging the large investigations made in the great laboratory of life. "All the same," he says, "our first advice to a student of psychology would be to read novels and go into the world." He finds a like overvaluation, in individual psychology, of the method of the questionnaire relatively to the judicious use of autobiography and memoirs. Finally, as representing a different type of thought, he instances the dynamic, teleological psychology of Paulhan. He regards this point of view as useful to oppose to absolute mechanism, but not any more scientific.

All this is preliminary to the detailed demonstration, in the psychology of the sentiments, of the insufficiency, and also of the relative value, of any one method or theory. The subject is approached, in the second chapter, by a series of definitions. Sentiments (feelings) are defined as subjective, individual facts of consciousness, as opposed to images and thoughts, the objective facts of knowledge. They are also defined as forces acting within the limits of a determinate body. From this latter point of view every fact of consciousness can be regarded as a sentiment. The distinction is drawn be-

tween conscious and unconscious, or 'real,' sentiments, and again between sentiments as tendencies and as mental states. The term tendency is used to cover continuity of process as well as direction towards an end. After much that is fine and discriminating, it is something of a surprise to find emotions described as affective states attaining a certain degree of consciousness and comprising pleasures and pains, and to see the passions defined in no other terms than as the tendencies that arise in consequence of a felt or imagined pleasure or pain. The three succeeding chapters develop, with critical reference to opposing views, the principal distinctions given above. Then follows, in the sixth chapter, a classification of theories. These relate to the nature of the sentiments and to methods of treatment. The sentiments can be regarded as intellectual, as organic, or as special facts, and they can be treated by the physico-mechanical, by the physico-chemical, or by the biological method. As a fourth, yet common, method may be added the classification preliminary to any investigation. The distinction drawn between the physico-mechanical and the physico-chemical methods is that the former treats the sentiments as measurable forces in mechanical relation, while the latter treats them in their relations of succession and coexistence, but apart from any idea of teleology. The rest of the work contains an elaborate investigation of these views and methods. The thesis sought to be established is that, whatever the nature of the psychological theories relative to the sentiments, there is no one which is absolutely to be preferred, but that such theories are modes of explanation verifiable or simply utilizable within restricted limits (p. 106). And the general conclusion is, that a psychology should be modest, free, supple, undulating (*ondoyante*), not very abstract and not at all pedantic (p. 303).

With these results the majority of American psychologists, at least, will probably heartily agree. But though they will read with complacency the complimentary references which M. Rauh makes to the breadth of view of a number of them, it may not be without profit even here to ponder anew the lessons of his book. He possibly exaggerates the distance which separates a philosophical theory from a scientific and underrates the value for science itself of the attempt to carry through systematically a chosen methodological points of view. Nor is he perhaps just at all points to the authors he criticises. He treats, for example, Paulhan's functional teleology as though it entirely disregarded the mechanical aspects of consciousness (p. 23) and James' 'stream of consciousness' as though it did not

itself recognize the difference between transitive and substantive states (Chapter IV.). But the book is rich in psychological observations and methodological suggestions, though at times so subtle as to be obscure.

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Beiträge zur Akustik- und Musikwissenschaft. Herausg. von C. STUMPF. 1 Heft, pp. vi + 108; 2 Heft, pp. 170. Leipzig, Barth, 1898.

Instead of the two volumes which would complete the *Tonpsychologie*, Professor Stumpf has adopted the more practical plan of publishing a series of monographs which are to contain his own researches and the work of other investigators on acoustics and the theory of music. These subjects will be treated from every point of view except the purely physical and the purely historical. The *Beiträge* have thus a wider scope than the author had proposed in his well-known work, and will interest a larger class of readers.

Heft 1 brings us a lengthy paper by Stumpf himself, entitled 'Konsonanz und Dissonanz,' in which he develops some of the fundamental ideas of the *Tonpsychologie*. The definitions given by Helmholtz, Lipps, Oettingen and Riemann are discussed and rejected. The difference between consonant and dissonant tones lies neither in unconscious functions nor in conscious feeling, neither in overtones nor in beats, but in the fusion of the tones themselves. This conclusion is entirely in keeping with the earlier views of Stumpf, and is now, in the main, widely accepted by psychologists. Discussion, in fact, has already raised the question: What, then, is fusion? And Stumpf faces it squarely.

Fusion does not consist in what the elder psychology termed the 'unity of consciousness.' It is not merely non-discrimination of simultaneous tones. All that we can say is that it is 'Einheitlichkeit'—the approach of the components to unison. Strictly speaking, we cannot define it any more than we can define blue or green. We may, however, investigate the causes or conditions upon which fusion depends. The only psychological factor worth considering is tone-similarity. But this, in the octave, is the effect, not the cause, of fusion; and in the other intervals it is altogether wanting. We are rather obliged to admit two fundamental relations: similarity, dependent upon the difference between vibration-rates, and fusion, dependent upon their ratio.

For the physiological explanation, we have to assume that a closer

combination of central processes corresponds to tones whose vibration-ratio is relatively simple. For this assumption we have precedents in other departments of brain-physiology. But when we attempt to go beyond this and arrange the details, we enter the region of hypothesis which is still obscure.

Stumpf's theory, however, is set in clearer light by the definitions he proposes. Tone-combinations which show a higher degree of fusion are consonant; those which show only a low degree of fusion are dissonant. The absolute distance that separates two tones does not of itself constitute a musical interval. To define this, we need the idea of tone-relationship. The interval is that relation between two tones which is determined primarily by their relationship and secondarily by their relative distance from each other. Increased intervals do not, as Helmholtz maintained, either gain or lose in consonance; the addition of an octave leaves both fusion and consonance as they were in the original interval.

The dualistic theory, according to which consonance depends upon the reference of the actually combining tones to a common fundamental or a common overtone, is rejected by Stumpf after a thorough criticism. Psychologically, it is unacceptable, because experience gives no evidence of any such reference or 'representation.' It is furthermore in opposition to our musical consciousness and is beset with inconsistencies.

Stumpf's own position is somewhat more fully explained in the article with which Heft 2 opens: *Neueres über Tonverschmelzung*. The laws of fusion which he had previously formulated and which he here defends against recent criticism, are these: fusion depends upon vibration-ratios; it is independent of the absolute and the relative strength of the component tones; it is not affected by the addition of other tones; it recurs in equal degree when the intervals extend over several octaves. If objections have been raised especially in regard to the last-named law, this is because of the natural tendency to pronounce the fusion of tones less perfect when their distance is greater and when their intensities vary. The removal of these and similar difficulties is largely a question of method. Both direct observation by trained subjects and collective experiments with untrained subjects, are admissible, provided the requisite precautions are taken.

A more detailed discussion of methods is presented by Max Meyer in his paper *Ueber die Unterschiedsempfindlichkeit für Tonhöhen*. The method of just-discernible differences, which Luft employed, is open to the objection that variations other than those in pitch influ-

ence the observer's judgment. Meyer's results, however, obtained by the method of true and false cases, agree in the main with Luft's, and go to show that, in the mid-region of the scale, the discriminative sensibility is independent of the pitch.

The same writer has a contribution on the theory of differential tones and of auditory sensations in general. It is a modification and development of views that he had previously advanced. The resonance theory is abandoned and the existence of resonators in the ear is set down as impossible, inasmuch as it conflicts with evidence furnished by anatomy and pathology. In its stead Meyer proposes an explanation based on an analysis of the tone-wave in the ear, which takes place in such a way that the effect of the smallest excursions is first lost and then gradually the larger die out. Greater amplitude of the air-wave means a larger vibration of the stirrup and consequently the displacement of more fluid. A longer portion of the basilar membrane is thus thrown into motion, and a larger number of nerve-terminals is excited. On this basis Meyer draws out curves representing different intervals, and calculates the extension of the membrane that corresponds to the resulting tones.

The most important of these *Beiträge* is the paper by Stumpf and Meyer on *Maassbestimmungen ueber die Reinheit consonanter Intervalle*. The experiments were made with musically trained observers, and the method of true and false cases was employed throughout. In the first series of experiments there appeared a tendency to judge the minor third 'pure' when the physically pure interval was somewhat reduced. Subsequently it was found that a considerable enlargement of the major third is needed to call out the judgment 'pure'; and the same result was obtained, in Stumpf's own case, from the experiments then made with the minor third. This would indicate a sort of 'Umstimmung' due to the fact that, in the later experiments, the observer had become accustomed to the major third. The contrast, however, says Stumpf, is one not of sensation but of feeling; and its influence varies with individual observers.

Further investigation yielded these results: the tendency to enlarge the interval increases from the major third to the fifth and from this to the octave; the order in which the tones are given does not materially affect the judgment of an interval as to purity; erroneous judgments occur more frequently when the tones are simultaneous than when they are consecutive; overtones affect the judgment unfavorably; sensibility to change in the purity of the interval is about the same for the third, the fifth and the octave, *i. e.*, equal variations

from the subjectively pure interval are in all three cases detected with equal certainty. If, on the other hand, this sensibility is measured by the exactness with which objectively pure intervals are judged, the results conflict decidedly with the traditional notion that the sensibility varies according to the degree of consonance.

The discussion of these results leads to a conclusion which Stumpf considers the most important outcome of the investigation. They are to be explained, he says, not by muscular sensations nor by tone-distances, nor even by fusion in various degrees, but by feelings which, according as they are positive or negative, enable us to say whether an interval is, or is not, pure. These feelings, developed in the course of individual experience, are subject to modification; the subjective 'purity-point' may shift; but they do not differ in quality for different intervals. They are the cause, not the consequence, of our judgment. Originally, they were based on the perception of variations from the normal degree of fusion; then, strengthened by association, they were so bound up with the sensory process that they are now aroused directly by the tone-impressions. At any rate, the feelings are there; and their behavior accounts for the peculiarities which have been noted in judging the purity of intervals.

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Psychologische Untersuchungen über das Lesen auf experimentellen Grundlage. B. ERDMANN and R. M. DODGE. Niemeyer, Halle a/S. 1898. Pp. viii+360.

Intelligent reading, we are told by the authors, consists of several processes. These are always closely bound together, but for convenience of discussion may be divided into the three following groups:

- I. The optical perception of the material signs.
- II. The reproduction of the sounds that are associated with the perceived words.
- III. The reproduction of the meaning.

Of these groups the first two are common to all kinds of reading where signs occur and are read (benennen). These two conditions are present in the reading of letters and words as well as sentences while the third factor is brought into play only when words are considered in sentence connection.

The problem of Professors Erdmann and Dodge is the consideration of the time relations of the first two groups; the conditions of optical perceptions of the printed symbols—letters, words, etc., and the reproduction of the associated sounds.

The early experimental investigations in these lines are discussed and dismissed as incomplete in execution and unsatisfactory in interpretation. Previously the subject had been considered from two separate standpoints, the psychophysiological and the psychopathological. The results of the psychophysiological researches led investigators to believe that in normal reading the reading unit is the word, not the separate letters forming the word. The pathologists, familiar with the varied cases of partial aphasia, considered the letter as the unit. The psychophysiological experiments (*e. g.*, those of Cattell in *Philos. Stud. and Mind*) were conducted, we are told, without reference to the different forms of aphasic disturbances, and the pathological theorists (*e. g.*, Grashey, in *Archiv f. Psychiatrie*) considered 'unsystematic data from the field of the physiology of sense perception' to the exclusion of the 'special results that psychophysiological research had already obtained.' A later attempt to combine both points of view (Goldscheider and R. F. Müller, *Ztsch. f. klin. Medizin*) the authors regard as unsuccessful. In method and conclusion the present authors would probably be classed with psychophysiological investigators. Words, they conclude, are optical wholes, but spoken reproductions of these words are letter-combinations. However, it is the opinion of the reviewer that neither by experiment nor by critical review of previous work have the authors explained from their point of view all the partial aphasias that led pathologists to consider letters the basis of the reading process.

The number of letters that can be read at one time is the first problem investigated by the authors. To determine this two methods were employed: (1) the *Spiegel-* and (2) the *Tachistoskopischer-versuch*. From a series of suitable mirror experiments, in which the eye could be observed by an assistant, the authors find that if a printed line is read and the head meantime kept fixed there is a regular change between eye movement and rest (*Ruhepausen*). The number of these changes is much less than the number of letters in a line, for a line 8.3 cm. *Do* had about five rest periods, and *E* for a 12.2 cm. line took seven rests. The number of the movement and rest period changes with the character of the context, being greater for unfamiliar than for familiar texts. The time necessary for reading familiar passages in the mother tongue and in a foreign language is less than for unfamiliar portions, and the times for reading familiar and unfamiliar portions in the mother tongue are less than those for similar portions of a foreign language. The rest periods, which are taken up with perception, interpretation, etc., are calculated to be from 12 to 20 times

longer than the time of movement. The latter results were not obtained directly, but were determined from other measurements. A much more satisfactory and an unquestioned result would have been obtained had the authors used a method similar to those devised by Delabarre and by Huey.

The field of perception (*erkennen*) was found to be greater than the field of distinct vision with eye fixed. This result was determined readily by dividing any line into the number of parts corresponding to the eye changes occurring during reading the line.

The reading of single words and of letters by *tachistoskopischer versuch* is next considered. These *Redeteile* should be shown for such time that they are seen as a whole, as a unit. Such a condition may be obtained only by exposing the letter or word sufficiently long to be perceived, but the exposure should be so short that the eye has no time to change its position. This time, the authors say, should be less than the time of a voluntary eye movement (reaction) over an angular distance of five to ten degrees (fovea to blind spot). The time for the eye's reaction is about 0.2 second and the authors adopt 0.1 second for all exposures of words, letters, etc. With this exposure three observers read correctly four and often five simultaneously shown letters. Four to five times as many letters could be read if combined into words. Some of this great difference the authors admit may be due to inability to hold in memory (and reproduce) more than five or six disconnected letters. Other experiments are said to show that words of characteristic form are more easily perceived than those of similar configuration, and words whose optical forms are more familiar to the reader (*muttersprachliche*) are more easily perceived than those which are less familiar (*fremdsprachliche*), and words in sentences are recognized not only by form, but also by grammatical and meaning relations.

The process of speaking a word the authors find not so simple as the perception of a printed word. The visual impression was found to be a simple simultaneous whole. The spoken reproduction of this visual impression is a successive acoustic-motor whole. Thus, the word VASE is a visual whole—VASE—but the spoken reproduction is a successive acoustic-motor whole—V-A-S-E. "The spoken word is a whole only in its combination of acoustic and of motor sensations corresponding part to part."

Following this analysis appears an account of reaction experiments by which the authors' hypothesis seems to be strengthened. The new work is preceded by an extended critique of the reaction

times made by Cattell (*Philos. Stud.*, III.). Some of the results of the authors are: (1) the reaction time to a letter and to a word of four letters is about double that to eight; (2) the time of speech reaction to one of twenty-six four-letter words is somewhat shorter than the time to a single letter; (3) the time of speech reaction to 4-, 8-, 12-, and 16-lettered words is in direct relation to the length of the words.

A chapter is devoted to the description of apparatus for the isolation of reading-pauses and in a final *Anhang* are described experiments determining the speed of eye movements according to the angular distance of movement.

A careful perusal of the book shows in parts carelessness in the preparation of the manuscript or of the proof. It is unfortunate that the volume, in many respects excellent, should be marred by so many typographical errors and errors in calculation (*e. g.*, pp. 86 and 87, column 10, Table VI. should have average 0.55 instead of 0.56 and columns 6 and 8 of Table VII. should have averages 0.09 and 0.31 instead of 0.1 and 0.28). Several conclusions are drawn from experiments the averages of which are given without noting the number of experiments (*e. g.*, Table III., page 58; reaction time averages, pp. 282, 283, etc.), and what is more to be regretted cases were found where conclusions are drawn from insufficient data (*e. g.*, an experiment in which twenty-six single German words were shown to *Do* [an American] and twenty-two to *E* [a German], each subject read twelve words correctly and the authors conclude that "the relation [right: wrong] in which the words for *Do* and for *E* stand to each other [6:7, 6:5] shows the apperceptive influence of greater familiarity with the word forms" [p. 158]. As a matter of fact it is probable that greater familiarity with certain words would permit their being more often perceived, but such a conclusion is unjustified from the results of this experiment).

Although all these errors detract from the value of the book as a reference for results, the volume will undoubtedly fulfil a mission of stimulus and suggestion. An excellent plan has been followed by the authors in numbering serially their conclusions. This makes the book convenient for every one, especially for those that do not care to read details. The reviewer is glad to be able to add that the book is, unlike many German monographs, very readable. The style is clear, the experiments well described and the criticisms fair and moderate.

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L'Année psychologique; 5e année, 1898. Edited by A. BINET.
Paris, Schleicher Fr. 1899. Pp. 902.

The *Année psychologique* for 1898 consists as usual of three parts: original articles, analyses of notable books and articles appearing during the year, and a general bibliography. The original section has been gradually enlarged; in the present number it covers 590 pages—about two-thirds of the entire volume—and the contributions embrace a greater variety of topics than formerly, giving a well-rounded character to the periodical. Among the original articles are two important topical reviews, one by V. Henri, on the Muscular Sense, and another by J. Joteyko, on Muscular Fatigue.

Henri finds a recognition of the muscular sense as far back in literature as Descartes (he gives no reference, however), and cites Berkeley, Reid, Erasmus Darwin, Bichat, Steinbuch and Thomas Brown among early writers as having alluded to this sense. To Charles Bell is given the credit of having developed the subject for the first time in a scientific manner, in which he was soon followed by Magendie and later by a number of other investigators. The author divides the researches into physiological, pathological, experimental and theoretic, but discusses only the first three here, reserving the theoretic side for a later paper. His own classification of sensations connected with the muscles is of interest. He finds three chief species: (1) Intrinsic muscular sensations, due to general stimulation of the muscles, tendons and joints, and including the sensations of rest and fatigue. (2) Sensations connected with a condition of muscular immobility; these include the various sensations belonging to specific positions of the motor organs and those due to different degrees of muscular contraction, such as relaxation, involuntary contraction, voluntary contraction, equilibrium of antagonistic muscles, and resistance to movement. (3) Sensations of movement, both passive and active, the latter occurring either with or without resistance. The sensations of movement give rise to perception of the direction, extent, rapidity and duration of the movement and to perception of the intensity of resistance. In connection with passive movement the author discusses the location of the specific end organs for these sensations, and concludes that the evidence indicates the joints as their chief seat, but with certain accessory sensations in the muscles themselves. The article concludes with a bibliography of 391 titles, with notes on the most important works mentioned.

Joteyko discusses the recent work on muscular fatigue. The paper deals almost exclusively, however, with researches using the ergo-

graph and other apparatus giving graphic records. The various forms which have been assigned to the normal fatigue curve are examined, and the author concludes in favor of a curve of three phases: a period of gradually increasing excitability, followed by a period of rapid decrease when fatigue first sets in, and finally one of gradual decrease till complete exhaustion occurs; this exhaustion is to be regarded, however, as nervous rather than muscular. The modifications of the fatigue curve in man due to differences in intensity of stimulus, amount of weight applied, and rhythm of action are discussed, with special reference to the problem of the maximum amount of work procurable. Among other topics surveyed are the influence of the temperature of the muscle, age of the subject and use of drugs in modifying the form of the curve. The periodicity of a curve due to partial neural restoration, and the influence of various conditions of blood circulation and oxidation of muscle on the progress of fatigue and restoration are noted. The bibliography, which is chronologically arranged, contains 98 titles.

Among the original investigations in the *Année* are three devoted to mental work and fatigue. All three approach the subject from the standpoint of physiological effects. This method, it will be observed, has found special favor in France, of recent years, as shown by the number of investigations of this nature published by French authors. In Germany, more direct tests appear to be favored, such as the measurement of the amount of mental work actually performed in equal periods of time, before and during the progress of mental fatigue, the accuracy of such work, etc. It would be interesting to compare the results of these two radically different types of method, with a view to determining their relative merit.

J. Languier's paper (*Essai de comparaison sur les différentes méthodes proposées pour la mesure de la fatigue intellectuelle*) describes four methods adopted by the author for measuring intellectual fatigue. (1) The relative frequency of the pulse when the subject is at rest and engaged in intellectual labor. (2) Changes in the temperature of the body caused by mental application. (3) Changes in muscular force, as measured by the progress of muscular fatigue. (4) Changes in tactile sensibility, as measured by the *æsthesiometer*. The author combines the results obtained by these methods in the following statement: "After labor sufficiently prolonged for the subject to be conscious of a certain amount of intellectual fatigue: his tactile sensibility was found to be diminished, but only in certain regions; his muscular strength was increased; his temperature was constantly lowered; and finally, his circulation underwent a distinct modification."

V. Henri (*Influence du travail intellectuel sur les échanges nutritifs*) discusses the influence of habitual intellectual work on the digestion, which he claims to be the most important of all its physiological effects. The experiments by means of this method were necessarily concerned with long periods of mental application—days, not hours—and involved the chemical analysis of the subject's solid and liquid discharges during these periods, which were compared with those occurring during like periods of relative inactivity. The subject adopted a regular diet, constant as to quantity and quality, which was so chosen that the weight of the body did not vary while it continued; the hours for meals and the consumption at each meal were also fixed. The actual experiments were preceded by a period of about a month, during which the exact quantity and nature of food were determined and the subject (the author himself) became accustomed to the diet. Following this was a period of 4 or 5 days during which he performed as little intellectual labor as possible; then a like period during which he performed severe intellectual work, requiring great concentration of the attention, for several hours each day; finally another period of rest, similar to the second. Owing to the lack of an assistant to perform the requisite chemical analyses during the periods of rest, the research was not completed, and the principal results obtained were the determination of a diet suitable for the experiment, which is discussed at some length; of special interest is the observation that rice is the most available vegetable for such a test, since it varies least and its use can be continued for a long period without distaste. The author insists on the importance of analyzing the solid excrements as well as the urine, which most investigators in this field have neglected to do.

A. Binet (*Note relative à l'influence du travail intellectuel sur la consommation du pain dans les écoles*) replies to a criticism by E. Blum of his paper in the last volume of the *Année*, on the influence of intellectual work on the consumption of bread among school children. Professor Binet found a gradual diminution in the consumption of bread during the scholastic year, and assuming the general constancy in amount of other foods used, concluded that prolonged mental work gradually impaired the appetite. M. Blum, as a result of similar investigations of his own, questions both the fact and the deduction. M. Binet maintains that while servants and instructors as well as pupils partook of the bread, this does not vitiate the results; the former were subject to the same influences (meteorological and other) as the latter, except in the matter of intellectual work,

which was therefore the sole variable condition. M. Binet promises more extended statistics on the subject at a later date, however. His method is an interesting one, and his results are of importance if they are sustained by further investigations.

The analytic portion of the *Année* contains fewer articles than usual, but greater care has been exercised in their selection, and they are fairly representative in the departments of Sensation and Pedagogy; the chief works on Hearing are summarized in a single review. The general bibliography, forming the third section, is identical with the PSYCHOLOGICAL INDEX issued by this REVIEW.

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VISUAL PERCEPTION.

Die optische Localisation der Mediane ebene. M. SACHS und R. WLASSAK. *Zeitsch. f. Psych. u. Phys.*, XXII., I., pp. 23-46.

This paper reports a series of experiments in which a subject seated in a dark room was shown a narrow vertical slit uniformly illuminated from behind, and was required to judge, from various positions of the head and eyes, whether the slit was straight ahead or on the right or left side. In presenting the results the authors draw a distinction which is of cardinal importance for their theoretical interpretations. It is the distinction between correctness (*Richtigkeit*) and certainty (*Bestimmtheit*) of judgment. Correctness means the degree of correspondence between the objective median plane of the body and the average judgments of the subject. Certainty means the narrowness of the area in which the judgments right and left may overlap, since the narrower this area the more closely defined is the judgment, 'straight ahead.'

Correctness is greatest when the head is in its normal position, *i. e.*, with its median plane coincident with that of the trunk, and when the eyes are left free to fixate where they will. When one eye is covered, the correctness is reduced and varies according to the eye used. When the head is turned, the median plane of the head becomes the determining plane for judgment, the correctness is accordingly small. From this it is argued that the sensations of movement from the neck muscles are of small importance in these judgments.

Certainty of judgment is regarded by the writers as of much greater significance than correctness. The highest degree of certainty found in any of these experiments was obtained by fixating the eyes steadily on

some bright point placed at the right of the median plane, the head being in such cases held in the normal position and the eyes being turned to the fixation point. These were the only conditions in the series of experiments under which the eyes had a definite point of fixation. In all other cases the eyes were left to wander until the slit appeared and then they fixated the slit. The argument of the authors from these results is that the most favorable conditions for judgment are not obtained from free movements of fixation.

Further evidence against the movement hypothesis is found in the fact that when the slit is moved through the field judgment is not so certain as when the slit is shown successively in a number of stationary positions. Also when movement from the lateral point of fixation to the slit is allowed, judgment is less certain than when the eyes are kept fixated on the point.

On these grounds the general conclusion of the whole paper is that sensations of movement do not play any important part in two-dimensional visual localization. Such localization depends rather on the relation of the image to the median axis of the retina. In short, the interpretation is in favor of Hering's theory of visual space perception.

The basis for such a general conclusion does not seem to be at all adequate. The number of results given is very small. The authors offer those presented, 'as examples,' but generally the examples are limited to one set of figures. In a judgment of such complexity certainly one or two cases will not serve as sufficient basis for general inductions. Again, it is not clear what the authors mean by the judgment 'straight ahead.' The position of the head does not, in the ordinary circumstances of life, or in any other experiment with which the reviewer is acquainted, determine our perceptions of the median plane of the trunk in any such way that we are illuded into the belief that the trunk has moved with the head. It is not easy to see, therefore, on what grounds it is argued that the influence of sensation from the neck muscles is unimportant. Finally, the high degree of certainty resulting from fixation of a lateral point is probably not due so much to the positions of the images on the retinas as it is to the fact that under these circumstances, and under these circumstances only, the subject had a definite point of comparison given in the field of vision, whereas in the other cases the localization depends on a much less direct and simple judgment. That such an explanation as this, rather than the one given by the authors, is the true one, would seem to appear also in the fact—which is altogether too easily disposed of in the paper—that correctness and certainty do not follow the same laws. This

being true, it would seem to be obvious that the degree of correctness is the more important datum for generalization in regard to the mode of localization. Certainty merely gives us an indication of the directness or indirectness of such judgments of localization. Any vagueness to be found in any of the cases just described is as likely to result from vagueness of bodily sensations of touch as from uncertainty in movement sensations.

The Perception of Horizontal and of Vertical Lines. Prof. B. O. PEIRCE. Science, Sept. 29, 1899.

Prof. Peirce reports in this article a large number of observations on the accuracy with which horizontal and vertical visual directions can be judged when all objective lines of reference are removed. The paper is unique in that it confines itself to a statement of the methods employed and the results obtained, no attempt being made to interpret the facts discovered or to establish any general principles of space perception.

The first method of these experiments was to allow the subject to turn the eyepiece of a horizontal telescope containing a single cross hair until the cross hair seemed either horizontal or vertical. A piece of ground glass placed in front of the object glass excluded all disturbing images. The second method used was the following. The observer looked at a surface crossed by a single line, through a tube which was two meters long and 35 centimeters in diameter, was blackened inside and was supplied with several diaphragms to prevent reflection. The line was now placed by the subject in what seemed to be a horizontal or a vertical position and the degree of deviation from the objective horizontal or vertical was recorded.

The results show that children and others who are without training in judgment of direction tend to set the line carelessly, but, after all, average fairly near to the objective standard. Training reduces the amount of variation. Astigmatism, even of a pronounced form, does not affect the judgment. When monocular vision is tested it is found that the line which seems horizontal to the right eye must be rotated slightly counter-clockwise in order to appear horizontal to the left eye. Tipping the chair or platform on which the subject sits or stands seems to confuse the subject somewhat and results in a lower degree of accuracy of the judgment. No constant relation was found between the direction of the tipping and the direction of error in the judgments. Deviations are also greater when the head is turned so as to

look over the shoulder, or when the body is bent so that the subject looks between his legs. When the body is erect and the head is much inclined to the left deviations are constantly counter-clockwise. When the inclination of the head is to the right the deviations are clockwise. The same holds for readings taken when the observer lay on a horizontal shelf on the left or right side. The deviations in such cases sometimes reach as high as 20 and 22 degrees.

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La phonétique expérimentale appliquée à l'enseignement des langues vivantes. Par ADOLPHE ZUND BURGUET. P. 35. Paris. 1898.

Applications pratiques de la phonétique expérimentale. By the same author. P. 24. Paris. 1899.

While these two pamphlets aim to discuss the practical side of experimental phonetics, they give a brief exposition of the present state of this method of research and a concise illustrated description of the appliances peculiar to it. The phonetic elements of a language are regarded as differing in duration, intensity, pitch and quality according to the relations of the various organs of speech to each other.

It was the recognized inability of ordinary observation to discover the exact relations necessary to the production of different sounds that finally led to the invention of the following appliances: (1) an artificial palate by which the relation of the tongue to the hard palate can be determined, (2) *les ampoules exploratrices*, rubber capsules of different sizes, for recording lip and tongue pressure, (3) *les olives nasales*, small bulbs for registering the amount of air discharged from the nose, (4) *l'embouchure*, a receiver for the air discharged through the mouth, (5) *le signal du larynx*, a complicated instrument for detecting the movements of the larynx, (6) *le cadran-indicateur*, an appliance for indicating to the eye and ear the amount of air expelled to produce a given sound. In use, a kymograph and recording tambour are necessary to 2, 3 and 4.

Though these instruments were primarily intended for research, the author proceeds to discuss them as a means of teaching foreign languages to youths and adults or of correcting faulty pronunciation in their native tongue. It is shown by specific cases how a child (who learns his mother tongue by ear) may acquire a faulty pronunciation and his ear habitually ignore the difference between his own speech and the normal. In such cases some other sense must be appealed to and here experimental phonetics steps in. This same habit

of the ear makes it difficult for an adult to learn a new language. In all such cases apparatus may be brought in to give by eye an indirect perception of the required movements.

The author calls attention to some facts of psychological interest.

He illustrates how futile it is to tell a person with a defective pronunciation that his palate must be so, tongue thus, etc., and how easy it is to teach him the correct pronunciation by apparatus where his eye can see, by a line upon the drum of a kymograph or by the dial of the cadran-indicateur when he has made the correct movements.

So far as the reviewer is aware very little attention has been given to the relations existing between hearing and the imitative movements of speech. Our principal manner of imitating movements is by eye—there are obvious reasons why this is true for animals as well as men—and not by ear; but a sound is imitated from what appears to be very meager data. It is well known that in a movement the kinæsthetic 'copy' is the complex experience of the correct movement, but here we usually have an ever-present objective test, as in striking a certain key on a piano.

In the case of an articulation we have only a remembered sound as the test. It is with some reason, then, that our author says the acquisition of a correct pronunciation is somewhat a matter of chance, for we see that with such an indirect test the wrong kinæsthetic 'copy' may become fixed. Now, the use of the afore-mentioned apparatus in correcting such an erroneous copy is to provide a visible test so that the correct movement may be noted among the random ones and repeated until it becomes fixed in place of the other. In teaching a new articulation it gives a familiar sign of the correctness of a movement whose copy may thus become fixed. The reviewer suggests that these methods may be valuable in teaching the deaf to speak.

The author passes hastily over variations in articulation because he has other points in view, but it seems especially important to know something of the exactness with which words are pronounced. If experimental phonetics is to maintain its claim to an exact method of perpetuating a language, the variations of the individual and of the individual from his fellows must be known. In any case this would be an important research from a psychological point of view.

As a whole, experimental phonetics is a laudable achievement and is one of the more recent triumphs of the exact method, but it is too early to decide upon its value as a method of instruction, when it can at best have only a limited application.

CLARK WISSLER.

The Memory Image and its Qualitative Fidelity. I. MADISON BENTLEY, PH.D. American Journal of Psychology, XI., 1, October, 1899, pp. 1-48.

The author tries 'to determine the exact place of the image in the memory consciousness' and 'to discover the changes which the image undergoes in the course of time'; to which are prefixed an examination of the place given to the image in the memory literature, and a discussion of the nature, function and genetic significance of the image. His experiments, conducted by the comparison method, consisted in presenting successively two shades of gray, made by a Marbe adjustable color mixer. A norm and two variations were used, one having 5° of arc more white, and the other 5° less than the norm, a difference considered to be about liminal. The subject judged whether the second shade, 5 seconds later, was the same as, or lighter or darker than, the norm. The experiments were carried out under two conditions of illumination. One set was done by diffused daylight and another in the dark room where the rotating disc was the only object affecting the retina. It was found that in the daylight the subjects judged the second stimulus to be darker, when it was the same, or lighter, more often than they did in the dark room. This Dr. Bentley conceives to mean that the memory grows lighter in the daylight and darker in the dark (p. 47), thus showing that the stimulated or unstimulated state of the rest of the retina plays an important part in the quality of the memory image. He finds that 'the tendency of the memory to lighten increases with the length of the interval between stimuli.' Other results are that from 2 to 6 seconds may elapse between stimuli without uniformly affecting the brightness of the memory image; that the infidelity (sic) of the memory image increases from 1 to 5 minutes, but the memory image itself is 'more readily producible after 5 minutes than after 1 minute.' The two methods above mentioned were supplemented by a third, a series of experiments having been performed in which the second stimulus was gradually altered until the subject thought it equal to the first; and three 'subsidiary methods' were tried and found unsatisfactory, viz.: recall and selection (different colored papers twice exposed); aqueous solution of pigment formed by burette droppings, which was found defective as an objective standard; and direct reproduction (the subject mixing and applying a color wash to paper).

It seems curious at first sight that a research nominally upon the qualitative fidelity of the memory image should yet be conducted in such a way that the actual presence of the memory image itself as a

part of consciousness during the period of time occupied by the experiment is not essential. But the fact remains that a record of images was kept showing that in one-sixth of the experiments the subjects had no visual image at all. Their introspection showed, instead, verbal mental content. They helped their memory for brightnesses by saying 'dark gray,' 'light gray,' etc., mentally. One with feminine *Apperceptionsmasse* interpreted the shades into likes and dislikes of gray cloth dress goods. From a comparison of the hundred imageless experiments, and the five hundred experiments that had images, with the accuracy of recall Dr. Bentley infers that an 'imageful recall' is better after a lapse of five minutes than after a lapse of one minute.

In connection with the interpretation and application of the foregoing experiments, two questions present themselves. (1) Does the comparison of two objective stimuli tell anything about the 'qualitative fidelity' of images, particularly when those images are of such a nature that they may or may not be a part of consciousness during the experiment? Is not the research, then, rather a quantitative estimate of retentiveness, especially that part of it concerning the effect of time upon the memory? (2) Why should experiments upon imagery, whether visual or otherwise, be concerned with memory work? To be sure, all images, as representations, are memory images; even the images which are the groundwork of the productions of creative imagination are memory images to the extent of being composed of elements belonging to the subject's past. But though all images may be regarded as memory images, and though by introspection much clearer insight may be gained into the processes of memory, much more will be gained by leaving the memory aspect of images out of account and paying stricter attention to the description of the images themselves and their relations one to another.

WILFRID LAY.

COMPARATIVE PSYCHOLOGY.

On the Instincts and Habits of the Solitary Wasps. G. W. and ELIZABETH G. PECKHAM. Wisconsin Geological and Natural History Survey, Bulletin, No. 2, Madison, Wis., 1898. 245 pp. With plates.

Dürfen wir den Ameisen und Bienen psychische Qualitäten Zuschreiben. ALBRECHT BETHE. Pflüger's Archiv, LXX., 1898. 85 pp.

- Studies on Reactions to Stimuli in Unicellular Organisms.* H. S. JENNINGS. II. *The Mechanism of the Motor Reactions of Paramecium*, American Journal of Physiology, Vol. II., No. 4: 1899. III. *Reactions to Localized Stimuli in Spirostomum and Stentor*, American Naturalist, Vol. XXXIII., No. 389, 1899. IV. *Laws of Chemotaxis in Paramecium*, American Journal of Physiology, Vol. II., No. 4, 1899. V. *On the Movements and Motor Reflexes of the Flagellata and Ciliata*, American Journal of Physiology, Vol. III., No. 6, 1900. *The Psychology of a Protozoan*, American Journal of Psychology, Vol. X., No. 4, 1899.
- Animal Behavior.* C. O. WHITMAN. In 'Biological Lectures delivered at the Marine Biological Laboratory of Wood's Holl,' Boston, 1899.
- Haben die Fische ein Gedächtniss.* L. EDINGER. München, 1899. 30 pp. (Reprinted from the Allgemeinen Zeitung.)
- Do the Reactions of the Lower Animals against Injury indicate Pain Sensations?* W. W. NORMAN. American Journal of Physiology, Vol. III., No. 6.

These titles represent a real advance in comparative psychology. Though dealing with widely different topics and in widely different ways, they have some common features that augur well for the progress of what one hardly dares call, at present, a science. All in common represent work done by scientific workers of ability in other lines, not by amateurs or enthusiasts. All show a critical spirit and an attempt to get beyond superficial observations and beneath verbal quarrels. They seem to promise that comparative psychology will soon cease to be a recreation for naturalists good, bad and indifferent, and a means of speculation for professors of philosophy, and become the serious business of scientific men.

The Peckhams studied the behavior of the solitary wasps, especially their stinging and nest-building activities. Their method was chiefly patient observation of the animals in their natural surroundings, though they made frequent use of artificial conditions. Their important conclusions are that the instinctive activities observed (1) were in the form of coarse, rough-hewn responses to the various situations involved, (2) varied with different individuals, and (3) were modifiable by experience. They deny the validity of Fabre's inference that these insects display wonderful precision and discrimination in stinging in the exact spot required in order to paralyze the victim, and

show what is apparently decisive evidence to support their denial. Their work is reported with great detail and is beautifully illustrated.

Dr. Bethe's general attitude is in sharp contrast with that of the Peckhams and the excellence of his work shows that no single way of studying animal behavior is the golden road. He realizes the broadest issues instead of confining his questions to details; he everywhere attempts decisive experiments instead of relying largely on the results of evidence furnished by the natural course of events; he is a zealous defendant of a certain general theory, for which, one is tempted to say, he seeks evidence.

It will be proper to give only the broader conclusions to which his work leads him, since the evidence should be examined in his own account and since also none but an expert observer of insect life is qualified to criticise it.

Dr. Bethe wisely takes as the evidence of mental functions *modifiability of reactions*. Such modifiability must also be of a degree not to be accounted for by the mere plasticity of all bodily organs. He then shows that animals may be distinguishable by giving off certain substances with different chemical properties to which olfactory organs react. He finds the reactions of ants to so-called 'friends' and 'enemies' to be merely reactions to ants having a different smell from that of those in the nests. 'Enemies' washed and anointed with the excretions of the nest inhabitants are no longer treated as enemies, though of widely different color and size. This reaction, he says, is in no sense acquired or learned or modifiable and does not involve any sort of consciousness. He finds their finding their way to food and to the nest to be due again to a reflex which causes them to follow the trail left by the first accidental passenger, this first passenger following his own trail back. The gradual straightening of such trails is due to the cutting off of complete loops and such straightening of curves as might happen from the automatic following of such a trail. This trail is, however, complicated by being polarized. That is, the trail made by a loaded ant differs from that made by a free ant and the reflex act for a free ant differs from that of a loaded ant. This is his explanation of the fact that an ant picked up, turned around and put on a trail will again resume his old direction, also of the appearance of coöperation shown when one ant going from the nest happens to take the load from a returning ant, both then turning back, the former to the nest, the latter to the source of food. All these assertions are based on direct evidence, though at least one important point is not made thoroughly clear, namely, why the loaded first ant goes back on

a trail which would seem fitted to arouse movement only in the opposite direction in his case. As before Bethe denies the need of any mental factor. "In the case of the ants finding the way does not rest on a mental process. It is rather a complicated but analyzable reflex mechanism."

He also finds no sign of communication or of adaptation to really new circumstances, though his experiments along the latter lines seem to have been few.

Bees like ants react not to 'friends' and 'foes,' but to customary and strange scents. But their success in finding their way seems to be even more of a problem than any other investigators have supposed. Not scents, nor differences in brightness (though both may have some little influence) nor shape, nor size nor the earth's magnetism guide the bee in its movements. Dr. Bethe has tested each of these hypotheses in some cases with extreme ingenuity, and fails to find any one at all satisfactory. Bees come back to the *place* in space from which they started regardless of whether the hive be still there or the surroundings changed or the scent different or they themselves loaded with magnets. 'A to us entirely unknown force' controls the direction of their flight.

Finally bees do not profit by experience or necessarily possess consciousness. Dr. Bethe makes such statements emphatically, though to my mind one fact which he reports suggests that perhaps they may, and he has not perhaps wholly nullified the force of the evidence of Lubbock, Wasmann and others. One respects him however for confessing to 'eine uns ganz unbekannte Kraft' rather than calling in 'Intelligence' as a purely negative and verbal resort.

Dr. Jennings has gained really brilliant results by reason of the extreme thoroughness of his work. By examining the so-called chemotaxis, thermotaxis, thigmotaxis, etc., of several typical micro-organisms he has apparently brought order out of chaos and reduced a mass of mystery to a few clear and simple facts. I say apparently because as yet his results are not everywhere accepted. By going to the bottom of the matter and watching the actual behavior of these animals when they 'are attracted by' certain things and 'avoid' others, he has found that they really have only slight modifications of a single accomplishment, a solitary reaction. On increase of stimulation they turn toward one side and shoot ahead again. This may be preceded by a stop, contraction and backward movement. Some forms show also a differentiation in that they go back in the case of a mechanical stimulus only when such stimulus is applied at the anterior part of the body. If applied at the posterior end they go forward.

Apart from these modifications the micro-organisms, studied show no specialized reactions. This one process brings about all the phenomena of congregation in certain spots, etc., described by previous observers, because, random movements bringing the animals into such spots, this single mode of reaction prevents their getting out.

Dr. Jennings' conclusion regarding the amount and sort of consciousness justly ascribable to these protozoa is that no more is needed to account for their behavior than for that of a muscle cell in the human body. He finds no signs of modifiability in the reaction.

Professor Whitman's paper contains a good deal of information valuable for its own sake, but is best considered as an argument against the view that instincts are inherited habits and represent the accumulated remains of individual adaptations. Professor Whitman contends that instinctive acts have the same mode of origin as reflexes, digestion, excretion and all other functions, that they are due to organic features which are the result of germ-variations, and that we should therefore expect to find a continuous development of the instincts of later forms from those of earlier. The evidence which he presents is instructive in the highest degree. The comparative psychologist can no longer rest content with enumerating and describing an animal's instincts; he must now try to follow Professor Whitman and show their evolution, a hard but fascinating task.

Dr. Edinger studied by means of a questionnaire the power of fishes to adapt their conduct to fit novel situations. He decides that they can because of the phenomena of taming and association of the sight of an attendant with the impulse to come for food. He is very chary about believing in any further mental adaptations than these, and seems to allow that fishes without any homologue to the mammalian cortex can have feelings only because he is compelled to. This work is interesting, more because it promises that the comparative neurologists will soon make use of psychological methods than for its immediate conclusions.

Dr. Norman studied the reactions to mutilation of representative animals from the flat-worms to the fishes, and found that they gave no evidence that the animals in question felt pain. The nature of his method and the quality of the work may perhaps be best shown by a quotation.

"If an earthworm be cut in two in the middle, only the posterior half shows the squirming and jerking motions which appear to indicate pain. The anterior half crawls away. * * * It would certainly be very strange if only the posterior half of an earthworm should show

pain symptoms, while the front half, which contains the brain, showed no such reactions. Still more remarkable, however, are the results as one continues with the division of the pieces. Let us designate the front half of the divided worm with a and the posterior half b . Now if we cut a in two in the middle, the front piece, which we will designate as a_1 , elongates and creeps forward, while the posterior piece a_2 executes strong jerking and squirming motions. Now if we cut in two the piece b (the posterior half of the worm), the front piece b_1 behaves or reacts as a , and the posterior piece b_2 as a_2 . We now see that each time the whole animal or either half of it is cut in two the posterior piece makes squirming and jerking motions while the front piece makes no motions or reactions that could be considered as indicating pain. * * *

Dr. Norman goes on to show that as any posterior piece might as well, by a different scheme of cutting, have been a front piece, the squirming, etc., can signify nothing more than a specialized movement in the case of impulses *travelling posteriorly*.

Dr. Norman's patient objective work should serve as a warning, possibly a rebuke, to those psychologists who speculate freely about all sorts of elementary conscious processes in the lower animals without having really any solid knowledge of what their nervous systems as mere mechanisms are capable of, and without ever looking at the facts first hand to find out.

EDWARD THORNDIKE.

NEUROLOGY.

The Nervous System and its Constituent Neurones. Designed for the Use of Practitioners of Medicine and of Students of Medicine and of Psychology. LEWELLYS F. BARKER, M.B., Tor. New York, D. Appleton and Company. 1899.

The considerable importance of this elaborate volume consists, not so much in the opinions of its author which it expresses, in number relatively few, as in the fact that it summarizes just that great body of neurological research in which no modern psychologist can fail to be extremely interested. The labor which this volume represents is suggested by the index of authors and investigators from the products of whose industry it is compiled, for this list contains 700 names more or less, ranging from Acquisito to Zuckerkañdl.

The work is divided into six sections (the last of them constituting two-thirds of the book), the titles of which are as follows: The History

of the Development of the Neurone Concept; The External Morphology of Neurones; The Internal Morphology of Neurones; The Histogenetic Relations of the Neurones; The Neurone as the Unit in Physiological and Pathological Processes; and On the Grouping and Chaining Together of Neurones in a Complex Nervous System like that of Man and [the] Higher Animals.

The first section deals with the neurone concept, as derived from the researches of His, Golgi, Forel, and Ramón y Cajal, gives at some length due credit to the staining discoveries of Golgi (especially that of the use of silver impregnations), and discusses interestingly the origin and employment of the term neurone. Held's scientific contributions regarding the anatomical relation of neurones, when properly viewed, he considers confirmatory rather than the contrary of the neurone theory. He thinks Apáthy's discoveries far less revolutionary than some consider them, and, on the whole, advises a degree of scepticism for the present regarding his 'deductions and hypotheses'; it is, he says, 'altogether too early, however, to pass judgment upon Apáthy's views,' although he appears to argue strongly against that now eminent worker's notion that some nerve cells are solely trophic in function. The great service of Waldemeyer is emphasized (he having, in 1891, brought all the converging neuronological views to a focus for the first time) a service, by the way, which Dr. Barker has in this very book almost duplicated. The neurone concept is summed up in little thus: "The nervous system, aside from its neuroglia, ependymal cells, blood-vessels, and lymphatics, consists of an enormous number of individual elements or neurones. Each neurone in its entirety represents a single body cell. These units are at first *entirely* (if protoplasmic bridges be excepted) and continue throughout life *relatively* to be morphologically, and in part, at least, physiologically independent of one another." He thinks there is no sufficient evidence of a 'diffuse neural network.'

Section second is devoted to the general appearance of the neurones as regards their external shapes and relations, but can have no detailed abstract here. The author notes with obvious great interest the very recent notion of Nissl (1898) regarding an intercellular substance as making the difference between the gray matter and the white. In closing this section of his book, its author takes occasion to express surprise, not too well based, at the mass of hypotheses as to sleep, anaesthesia, hysteria, and double consciousness which have grown up about the 'feebly supported' retraction theory of the dendrites.

The third section, discussing the internal structure of the neural

element, is summarized in its last, the fourteenth, chapter, and especially, as is stated, in the following paragraph: "A neurone is made up, like all other cells, of nucleus and protoplasm. In the latter a centrosome and a so-called attraction sphere are present; at least they have been demonstrated in a certain number of nerve cells. The protoplasmic portion of the cell can be roughly divided into a peripheral exoplasmic portion and a central endoplasmic portion. In neurones, as in muscle cells, though less distinct in the former than in the latter, there is a tendency to a fibrillary structure, the fibrillation being more pronounced in the peripheral exoplasmic portion of both nerve and muscle cells than in the endoplasmic portion of the protoplasm. In both exoplasm and endoplasm there can be made out, in tissues which have been fixed, a more or less homogeneous ground substance in which are deposited larger and smaller masses of a granular nature."

Section fourth, treating of the 'histogenetic relations of the neurones,' need not here receive even brief review, it being almost wholly embryological. The genetic psychologist will find the chapters of this part, however, of no little suggestiveness.

The fifth section, that perhaps on the whole of greatest interest to students of animal life's mental aspect, discusses, after an introductory chapter, the degeneration and regeneration of neurones; their irritability; the neurone as a unit of nervous system; the direction of conduction in neurones and the theory of their dynamic polarity; the relations of trophic to nervous functions in the neurone; and the histological alterations in neurones due to the action of poisons and the comparison of these with the effects of traumatism.

The last section of this work, devoted to the relations which neurologists have thought the neurones bear to each other, constitutes 771 pages and has a table of contents of its own. Both the peripheral and the central connections of the cells are exhaustively and elaborately discussed from the view-points of many investigators. Its wealth of detailed fact and more or less well-supported theory is, however, very far beyond the limits of reviewing here. The best of readers will find it a maze he cannot, if he would, unravel; time will do it better.

The volume itself is an excellent example of modern typography and illustration, and is well printed on good, though of necessity, thin paper. It consists of xxxii + 1120 pages, and about these are arranged 676 generally excellent illustrations, some of them in colors like the stains, taken from very many recent sources. No pains have

been spared evidently to make these of the greatest possible use to the readers of the book. Besides the illustrations in the text three lithographic plates in colors ornament the volume. Two indices, one of authors and the other of subjects, add still further to the unusual value of this work of Dr. Barker.

On the Bases and Possibilities of a Scientific Psychology and Classification in Mental Disease. W. LLOYD ANDRIEZEN, M.D.
 Jour. Mental Science, Vol. XLV., No. 189. April, 1899. Pp. 257-290.

This interesting article has value not alone because it portrays an aspect of contemporary psychology as seen by a competent medical man and neurologist, but because in addition it suggests advance along a line where it is most needed to-day. In particular it offers a neurological sketch of psychogenesis which is suggestive for every psychologist.

With consciousness in the abstract, because transcendental, Dr. Andriezen has here nothing to do, it being a topic of metaphysics. In the widest sense consciousness is an endowment of the entire living organism; in the stricter sense, of the nervous system, particularly of the brain. Four methods of studying psychology are mentioned: self-observation, observation on our normal fellows, 'special study, observations, life history and collateral investigation of those with deranged minds,' and, lastly, child-study.

Observation of the very lowest animal orders shows feeling as the sole aspect of mind. The encephalon, developing as morphologic complexity increases, is a recipient organ for various sorts of sensorial stimuli coming to it by various specific pathways: (a) various special sense-organs; (b) 'kinæsthetic pathways from various movement organs:' the end-organs involved being the muscle-spindles of Kühne; the branching tendon-organs of Golgi; the spiral fibers surrounding certain muscular fibers; and the Pacinian corpuscles of fascia, tendon, and muscular septa; (c) by incoming tracts from the viscera.

A classification of the vertebrates is offered based on the constitution of the encephalon, and further, tentatively, according to the proportional extent of the development of the polymorphic layer of the cortex cerebri (the fractions here varying from $\frac{1}{8}$ in rodents to $\frac{1}{3}$ or $\frac{1}{2}$ in man). Because of its possibilities of usefulness this mode of classification deserves some attention.

Dr. Andriezen states that the 'law of psychogenesis' is as follows: "development takes place not only in the sensorial and kinæsthetic

centers, but in the psychical (relational) sphere which combines these two and follows definite lines; and further that during these stages the child is peculiarly impressionable to surroundings."

In new-born mammals while individual nerve-cells have already reached their full numerical growth, the individual nerve-cell in its entirety has by no means reached the acme of its evolution. This continues first, in the size of the cell-body and of its processes, and, secondly, in the extent, variety, and complexity of its connections. Certain other changes of a structural and chemico-physical nature also take place in cell protoplasm and nucleus. Qualitative evolution "comprises growth in the extent and complexity of the connections of the protoplasmic and nervous processes of the brain-cell." These are the important developmental changes as shown by the author's research on young cats by the Golgi method.

Education is suggestively considered from this biological point of view, and the development of the *ego* briefly traced. He distinguishes four stages in the development of the human brain: (*a*) the vegetative somnolescent (intrauterine); (*b*) the immanently sensuous and non-rational stage (the first months of life); (*c*) the primitive rational stage (up to end of the second year); and (*d*) stage of self-particularizing and integration of the *ego* (from the third year onwards). The restraining or ethical nature develops last, and is in a sense represented by the over-arching of the frontal lobes.

"The doctrine of the localization of functions in a central (nervous) organ is the basis which renders a study of psychology and psychopathology possible; such a central organ necessarily uniting within itself sensorial, kinæsthetic, and cœnæsthetic functions." The capacities which simple protoplasmic organisms have of sensibility and of response in definite ways constitutes a 'feeling.' "The 'law of pathogenesis' is that many of these evolutions in brain and mind, from the fœtal (vegetative somnolent) to the adolescent (sexually mature) stage, may undergo morbid alteration (perversion) or suffer defect (absence) and such pathological conditions of the brain are the bases of the insanities."

The references at the end of the article constitute a small but useful, because up-to-date, bibliography.

Psychotherapy; or Suggestion as a Cause and Cure of Disease

H. H. SEELYE, M.D. Medical Record, Vol. 56, No. 10. Sept. 2, 1899. Pp. 325-330.

In this timely and comprehensive address by a competent medical

man (a vice-president of the Massachusetts Medical Society), we have both a simple discussion of the philosophy of psychotherapy and precise evidence of the influence of the mind over the organic tissues as well as functions. Dr. Seelye attributes to suggestive influence on the subconscious self "the many authentic cures of both functional and chronic organic disorders wrought by homœopaths, osteopaths, hydropaths, electropaths, masseurs, faith curers, Christian scientists, religious enthusiasts, blue-glass cranks and by all the other fads that from time to time rage and flourish successfully for a while, only to give way at last to some other new and wonderful method of cure."

He describes at length eight medical cases, as examples, which exhibit either a marked influence of mind on body, or of suggestion, on both without actual hypnosis in any case. It is not often that an eminent physician gives publicly such unequivocal evidence for the control of body-tissues by the mind.

It would be very good for the public well-being could this article, so illustrative of the large field for so-called 'therapeutic' charlatanry, be scattered broadcast through the land.

GEORGE V. N. DEARBORN.

HARVARD UNIVERSITY.

Social Laws, an Outline of Sociology. By G. TARDE, translated from the French by HOWARD C. WARREN, with a preface by J. M. BALDWIN. New York, The Macmillan Co., 1899.

Professor H. C. Warren, of Princeton, has given us an admirable translation of that most suggestive book by M. Tarde 'Les Lois Sociales' which appeared in the Alcan Series in 1898. This is the first work of the French sociologist to be translated into English. It is a condensed statement of the leading ideas embodied in M. Tarde's larger works, namely, 'Les Lois de l'Imitation,' 'La Logique Sociale,' 'L'Opposition Universelle.' But it is rather more than a résumé. It aims at giving the internal bond that unites the three principal works of the French philosopher. Those are, as the author himself puts it, '*disjecta membra* of a single body of ideas' (preface). The unity of the conception may possibly escape the reader's notice when he considers each of the three works separately. In this little book, however, the intimate link between the philosopher's scattered ideas is brought forward with great clearness in the light of a general conception of science, previously but vaguely intimated by M. Tarde and only in the present work sharply defined and presented systematically in its

organic connections. According to M. Tarde, all science subsists 'on similarities, contrasts and harmonies,' that is, on repetitions, oppositions and adaptations (p. 202). Science seeks the laws that govern the repetition, opposition and adaptation of phenomena. In Biology, for example, the tendency of species to multiply in geometric progression (a law of repetition) forms the basis of the struggle for existence, and natural selection (a law of opposition) and the appearance of individual variations, the production of various individual aptitudes and harmonies and the correlation of parts in growth (laws of adaptation) are necessary to the proper functioning of both (pp. 7, 8). In sociology, likewise, we have to study the social phenomenon under three aspects corresponding, respectively, to the repetitions, oppositions and adaptations which it contains and which are obscured by a mass of variations, dissymmetries and disharmonies. The repetition aspect of social phenomena is furnished by imitation. Their opposition aspect must be sought not, as one might be tempted to think, at first sight, in the relation of two contrary or contradictory individuals, but rather in those logical and teleological duals, those curious combats between thesis and antithesis, between willing and *nilling*, whose stage is the consciousness of the social individual (p. 99). This miniature internal battle which is renewed a million times every moment of a nation's life and which takes place whenever a man hesitates between adopting or rejecting a new pattern offered him, whether in the way of phraseology, ritual, concept, canon of art, conduct, constitutes the infinitely minute and infinitely fruitful opposition that underlies history (pp. 83, 84), the moving principle of the bloodiest wars (p. 204), the germ whence proceed the three great forms of social strife, war, competition and discussion (p. 132). The fundamental social adaptation is some individual 'invention' that is destined to be imitated—for what remains locked up in the mind of its creator has no social value (p. 166). An invention is the felicitous interference of two imitations, occurring first in one single mind, and this harmony, though quite internal in origin, tends not only to externalize itself as it spreads, but also to unite with some other invention, in a logical couple, thanks to this imitative diffusion, and so on, until, by successive complications and harmonizations of the harmonies, the grand collective works of the human mind are constructed—a grammar, a theology, an encyclopædia, a code of laws, a natural or artificial organization of labor, a scheme of æsthetics or a system of ethics (pp. 204, 205). These three terms constitute a circular series which is capable of proceeding on and on without ceasing. It is through imitative repetition that in-

vention, the fundamental social adaptation, spreads and is strengthened and tends, through the encounter of one of its own imitative rays with an imitative ray emanating from some other invention, old or new, either to arouse new struggles, or (perhaps directly, perhaps as a result of these struggles) to yield new and more complex inventions which soon radiate out imitatively in turn, and so on indefinitely (p. 135).

Such are the main points of this extremely suggestive book. Certainly, some of M. Tarde's propositions will not pass unchallenged. His conception of science will undoubtedly be much discussed. The alleged circular series of repetitions, oppositions and adaptations claimed to be the typical subject-matter of scientific investigation is evidently nothing more than a vivid image. We cannot attach to it a deeper significance as M. Tarde would have us do, without transforming logical categories into hypostasies of the most scholastic character. Here M. Tarde shows the persistency of a constructive tendency which has oftentimes dragged his clear and powerful mind far from the *via regia* of facts, into the turbid region of metaphysics. We are fervent admirers of the great French sociologist. But one can believe, as we do, that M. Tarde has made a real discovery when he has shown the elementary social fact to be incidental to the transmission of something internal and mental from an individual to another; and yet, in spite of this assumption, which implies, however, the most vital points of Tarde's sociology, one may well perceive the misleading character of the proposed trichotomy of repetition, opposition and adaptation.

Prof. Warren has taken pains to render into clear and good English the vividly picturesque style of the French writer. His task must have been by no means an easy one. It is a matter of particular gratification to all who believe in the future of sociology that experimental psychologists of Dr. Warren's high standing should become so keenly interested in the popularization of the works of the man to whom, after Spencer, sociology owes most.

The book is brought out in an attractive and readable form. It will undoubtedly have many readers and help to prepare a warm reception to the promised translation of 'Les lois de l'imitation.'

GUSTAVO TOSTI.

NEW YORK CITY.

PHILOSOPHY AND LOGIC.

Essai d'une philosophie nouvelle suggérée par la science. Par LÉONCE RIBERT. Paris, Felix Alcan. 1898. Pp. 562.

The fundamental propositions which the author endeavors to establish are as follows: There is a principle of activity (*virtualité*) which is the source of all phenomena through its conjunction with matter. The universe is infinite in space and time. There is a complete determinism, and no such thing as absolute progress, only a relative and a seeming progress. The destiny of man is the hope of surviving in his works, in the lives of his children and in his general influence upon humanity. The work contains an elaborate review of the chief branches of science with the view of reaching a philosophical interpretation of their results. The author's main contention of a practical nature is his criticism of the pessimistic conclusions which his premises might seem to necessitate, but which, nevertheless, as he insists, are not the logical outcome of a true interpretation of the phenomena and laws of science.

L'Avenir de la philosophie. Esquisse d'une synthèse des connaissances fondée sur l'histoire. Par HENRI BERR. Paris, Librairie Hachette et Cie. 1899. Pp. 511.

As indicated by the title, the author endeavors to reach some definite philosophical results by means of the historical method. This method consists of a detailed study of the different schools of philosophical opinion, in which the evident conflict of ideas gives rise to doubt, and doubt in turn leads to a criticism which reveals a final precipitate of truth. He passes in review the history of philosophy during the seventeenth, eighteenth and nineteenth centuries; his conclusion is that both idealism and materialism have been discredited, and that the true hypothesis is monism. This is a working hypothesis only and has not been and can not be demonstrated. The future of philosophy is to be characterized by what he calls the reign of synthesis. There is to be progress because there has already been progress. By synthesis, the results of science will be unified; there will be a unity of science and of life, of speculation and of practical activities; there will be a moral order, and a true religion of humanity. The author's point of view is that essentially of positivism; there is, however, an unmistakable tendency to indulge in certain metaphysical speculations at points where the conclusions of positivism do not seem to satisfy him.

Critériologie Générale ou Théorie Générale de la Certitude.

PAR DR. MERCIER. Paris, Felix Alcan. 1899. Pp. 371.

The author gives a careful historical survey of the general theory of certitude; his criticism is sympathetic and fair. As to his own position, he holds that there is an objective validity attaching to our judgments, inasmuch as in the judgments which seem to carry with them a degree of certitude, the attributive relation of predicate to subject is indicated by the necessary belonging of the predicate to the subject. Therefore the predicate participates in the objective reality which originally pertained to the subject. The predicate being necessitated by the subject, and the subject in turn being unintelligible without the predicate, form therefore evident ground for certitude.

He defines certitude as a psychological reality independent of the causes which give rise to it. It is the complete accord of intelligence with an object as known. There is in certitude an element of repose which is its characteristic feature throughout the manifold forms which it may assume.

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The World and the Individual. JOSIAH ROYCE. Gifford Lectures before the University of Aberdeen. New York, The Macmillan Co., 1900. Pp. xvi + 588. \$3.00.

Notes on the Development of a Child. MILICENT WASHBURN SHINN. Berkeley, published by the University. 1899. Parts II. and IV. Pp. 179-424.

Des Indes à la Planète Mars; étude sur un cas de somnambulisme avec glossolalie. TH. FLOURNOY. Paris, Alcan. 1900. Pp. xii + 420. 8 fr.

Essays on the Foundation of Education. J. GODRYCZ. Lansing, Mich., Lawrence and Van Buren Printing Co. 1900. Pp. 168.

La Morale d'un égoïste. H. LAPLAIGNE. Paris, V. Giard & E. Brière. 1900. Pp. 259.

National Educational Association. Journal of Proceedings and Addresses of the Thirty-eighth Annual Meeting held at Los Angeles, Cal., July 11-14, 1899. Published by the Association, 1899. Pp. 1258.

Les Agnoscies la cécité psychique en particulier. V. NODET. Paris, Alcan. 1899. Pp. 22.

NOTES.

WE regret to record the death on February 2d of Dr. Leon M. Solomons, instructor of psychology in the University of Nebraska.

M. TH. RIBOT, professor of psychology in the Collège de France, has been elected to the chair of the Paris Academy of Moral Sciences made vacant by the death of M. Nourrisson.

THE New Year's honors annually conferred in Great Britain include a peerage for Sir John Lubbock, who will hereafter be known as Lord Avebury, a knighthood for Dr. T. Lauder Brunton, the physiologist, and a K. C. B. for Captain W. de W. Abney, whose researches on color vision are well known to psychologists.

MR. JOHN D. ROCKEFELLER has given \$100,000 to Columbia University to endow the chair of psychology held by Professor Cattell.

THE Congresses of the Paris Exposition include the first International Congress of Philosophy which will be held from the 2d to the 7th of August. There will be four sections: (1) general philosophy and metaphysics, (2) ethics, (3) logic, and (4) history of the sciences and history of philosophy.

M. GABRIEL TARDE, well known for his contributions to psychology and sociology, has been elected to the chair of modern philosophy in the Collège de France.

EDWIN GRANT DEXTER, A.M. (Brown), Ph.D. (Columbia), now of the State Normal College, Greeley, Colo., has been elected professor of pedagogy in the University of Illinois.

JUNE E. DOWNEY, A.M. (Chicago), has been appointed instructor in psychology at the University of Wyoming.

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